CALENDAR

OF THE

SCHOOL OF MINING

A COLLEGE OF APPLIED SCIENCE
(Affiliated to Queen's University)

KINGSTON, ONTARIO

SIXTEENTH SESSION, 1908-1909

All communications to be addressed to
The Secretary, School of Mining, Kingston, Ont.

CALENDAR

OF THE

SCHOOL OF MINING

A COLLEGE OF APPLIED SCIENCE
(Affiliated to Queen's University)

KINGSTON, ONTARIO

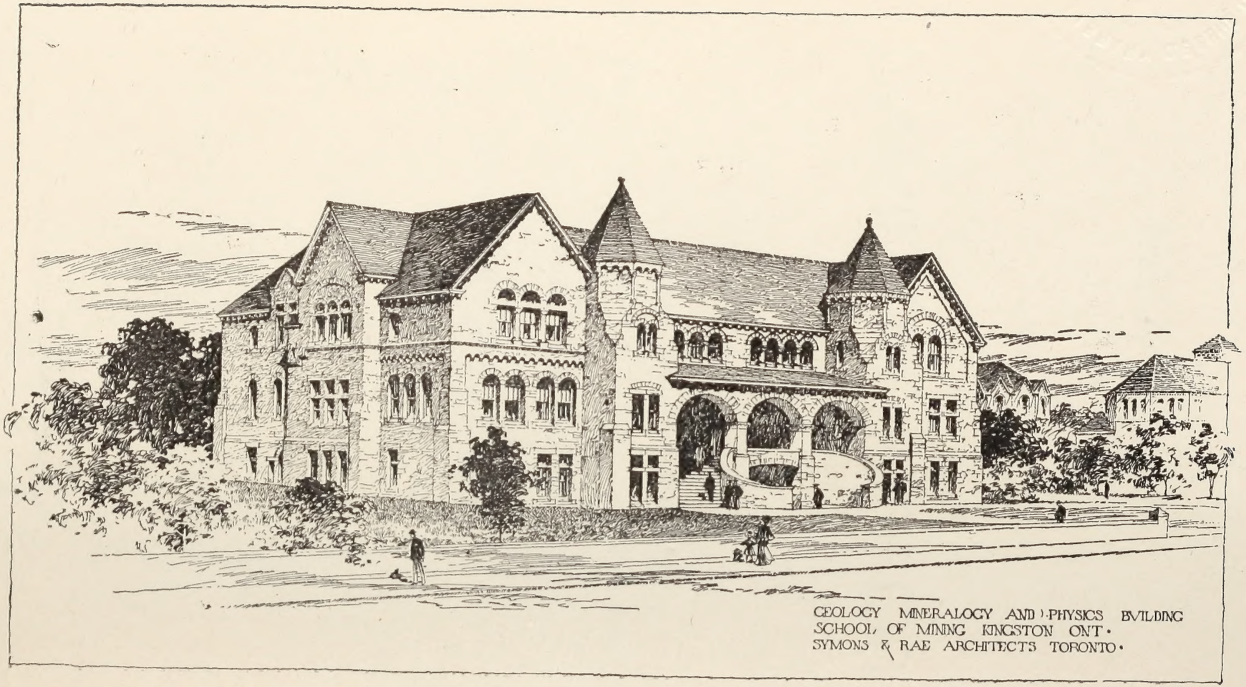
—

FIFTEENTH SESSION

1908-1909

—

KINGSTON:
PRINTED AT THE BRITISH WHIG OFFICE
1908



GEOLOGY MINERALOGY AND PHYSICS BUILDING
SCHOOL OF MINING KINGSTON ONT.
SYMONS & RAE ARCHITECTS TORONTO.

TABLE OF CONTENTS.

VISITOR.

His Honour Sir William Mortimer Clark, Kt. K.C.
Lieutenant-Governor of Ontario

Chairman of the Board of Governors.....Hon. Wm. Harty, M.P.
Vice-Chairman..... D. M. McIntyre, B.A.

BOARD OF GOVERNORS.

W. F. Nickle, K.C. .....Kingston
John McKelvey .....Kingston
T. W. Nash .....Kingston
Jas. Swift .....Kingston
G. M. Macdonnell, K.C.....Kingston
Hon. Wm. Harty, M.P. .....Kingston
A. Shortt, M.A. .....Kingston
Robert Crawford, B.A. .....Kingston
H. A. Calvin .....Kingston
W. Bruce Carruthers .....Kingston
Sir Sandford Fleming, K.C.M.G.....Ottawa.
D. M. McIntyre, K.C.....Kingston
R. E. Kent .....} Appointed by the City Council
D. A. Givens, B.A. .....}
Secretary-Treasurer .....Geo. Y. Chown, B.A.

CALENDAR.

1908.

July 2—Matriculation examinations begin at University and every Collegiate Institute and High School in Ontario.

Sept. 1—Applications, stating subjects and accompanied by fee, for Supplemental Pass or Matriculation examinations to be made to the Registrar.

" 4—Engineering Field Work I begins.

" 15—Supplemental Pass Examinations begin.

" 17—Matriculation Examinations begin.

" 30—Classes open (1st term).

Oct. 16—University Day. Fall Convocation.

Dec. 24—Christmas Holiday begins.

1909

Jan. 5—Classes re-open (2nd term).

Feb. 24—Holiday.

Mar. 31—Class work closes.

April 5—Examinations begin.

" 26—Meeting of Faculty to consider reports of examiners.

" 28—Convocation for distributing prizes, announcing honours and laureating graduates.

TIME TABLE

First Year.

	VIII.	IX.	X.	XI.	XII.	I.	II.	III.	IV.
Mon.	Jr. English A.B.C. Physical Drill E.F.	Math. I.	Surveying I (b)	Chemistry I.		Physics Lab. A.B. Drawing I. D.E.F.	Physics Lab. A.B. Drawing I. D.E.F.	Chem. Lab. A.B. Physical Drill C.D.	
Tues.	Jr. English D.E.F. Physical Drill A.B.	Math I.	Physics I.	Chemistry I.	Jr. English A.B.C.D.E.F.		Drawing I. A.B.C. Physical Drill E.F.	Chem. Lab. E.F. Drawing I. A.B.C.	
Wed.	Jr. English A.B.C. Physical Drill E.F.	Math. I.	Physics I.	Math. I.		Physics Lab. C.D.	Physics Lab. C.D. Physical Drill A.B.	Math. I. (b) (Astron.)	
Thurs.	Jr. English D.E.F. Physical Drill A.B.	Math. I.	Physics I.	Math. I.		Drawing I. A.B.C.D.E.F.	Drawing I. D.E.F.	Drawing I. D.E.F.	
Friday.	Jr. English A.B.C D.E.F.	Math. I.	Physics I.	Math. I. (a)		Physics Lab. E.F. Drawing I. A.B.C.	Physics Lab. E.F. Drawing I. A.B.C.	Chem. Lab. C.D. Physical Drill C.D.	Meeting of Engineering Society
Sat.	Physical Drill C.D.								

(a). Denotes First Term. (b). Denotes Second Term. A.B.C.D.E.F. Denote Sections of the Class.

TIME TABLE.

Second Year.

	VIII.	IX.	X.	XI.	I.	II.	III.	IV.
Mon.	Physics II.	Botany (a) C. Biology C. (b) Workshop G.	Chem. Lab. H. Math. II.	Min. I. A.B.C. Gen. Eng. I. D.H.E F.G.J.	Chem. Lab. B.C.F.G.H. Draw. II. A.E.	Chem. Lab. B.C.F.G. Draw. II. A.E.	Chem. Lab. B.C. Draw. II. A.E. Physics II. D.H.F.G.J.	Chem. Lab. B.C. Workshop E. Physics II. D.H.F.G.J.
Tues.	Math. II.	Workshop G. Survey II. A.E.J.	Math. II.	Workshop G. Min. II. B.C. Min. III. A(b).		Geology. I. A.B C.E.J. H. Draw. III. D.F.G.J.	Physics II. A.B.C.E. Draw. III. D.F.G.J.	Physics II. A.B.C.E Draw. III. D.F.G.J.
Wed.	Math. II.	Biology C. (b) Draw. IV. Chem. Lab. F. B. C. (a) Survey II. A.E.J. Physics III. G.	Draw. IV. Chem. Lab. F. A(a). B. Min. V. (a) Botany E.H.J. H. Physics III. G.	Draw. IV. Chem. Lab. F. A(a). Min. II. Min. III. B.C. A(b). Workshop G.	Physics II.	Survey II. A.E. J. Chem. Lab B.C.D.H. Workshop F.	Survey II. A.E. J. Chem. Lab. B C D.H. Workshop F.	Survey II. A.E.J. Chem. Lab. B.C.D.H. Workshop F.
Thurs.	Chemistry IV.	Gen. Eng. I. D.H.E.F.G.J.	Math. II.	Desc. Geo. Biol. and Public Health. Chemistry II.	Chem. Lab. B.D. Workshop G.	Geology I. A.B.C.E J. Workshop G. Chem. Lab. D.H.	Des. Geo. A.E. Chem. Lab. B.C.H. Workshop G.J.	Des. Geo. A.E. Chem. Lab. B.C. Workshop G.J.
Friday.	Math. II.	Biology C. (b) Chem. Lab. A.B.C (a). Survey III. E.J. Workshop F.	Chem. Lab. A.B. Survey III. E.J. Workshop F.	Chemistry III.	Qual. Analysis Workshop E.J.	Min. I. A.B.C. Des. Geo. D.F.G.J. Workshop E.	Min. I. A.B.C. Des. Geo. D.F.G.J. Workshop E.	Meeting of Engineering Society.
Sat.	Workshop A. (b) Min. Geol. Excursions or work in Museum. A.B.C. (a)	Workshop E. Draw. II. D.F.G.J Min. Geol. Excursions or work in Museum A.B.C. (a)	Workshop E. Draw. II. D.F.G.J. Min. Geol. Excursions or work in Museum A.B.C. (a)	Workshop E. Draw. II. D.F.G.J. Min. Geol. Excursions or work in Museum A.B.C. (a)				

(a) Denotes First Term. (b). Denotes Second Term. A.B.C.D.E.F.G.H.J. Denote Courses.

TIME TABLE

Third Year.

	VIII.	IX.	X.	XI.	I.	II.	III.	IV.
Mon.	Ore Dressing. A.	Elec. Eng. I. A.D.E F.G. J.	Chem. XII. E. J. Geology IV.(a) A.B.C. Geology II.(b) C. Physics IV. G.	Chem. XII. E. Gen. Eng. I. A. Mech. Eng. IV. F. Elec. Eng. II. G.J.	Quant. Analysis B.C.	Quant. Analysis B.C. Gen. Eng. II. D.E.F.G.J.	Chem. VI. (a) B.D. Chem. VII (b) B. Physics IV. G.	Min. IV. B. Physics IV. G.
Tues.	Min. IV. A.B.C.	Thermo. I. (a) A.D.E.F.G.J. Thermo. II. (b) D.E.F.G.J Chemistry XIII. B.C.	Geology III. A C. Hyd. Eng. I. E.J.F.H.	Metallurgy I. A.B.D.E.F.G	Min. IV. A B.C.	Struc. Eng. I. E.J. Min. IV. A.B.C. Mech. Eng. I. D.F.G.	Surveying IV. E. Elec. Eng. III. G.J. Mech. Eng. III. F.	Surveying IV. E. Elec. Eng. III. G.J. Mech. Eng. III. F.
Wed.	Metallurgy I. A.B.E.F.G.	Mechanical Eng. VII. A.D.E.F.G.J.	Geology II. A.B.C. Gen. Eng. II. D.E.F.G.J	Mining I. A.	Min. IV. A.B.C. Physics IV. G. Quan. Anal.(a) A.B.C. Mech. Eng. III. F.	Chemistry V. B. D. Rail. Eng. I.E. Physics IV. G. Mech. Eng. III. F.	Chemistry V. B. D. Rail. Eng. I.E. Physics IV. G. Mech. Eng. III. F.	Chemistry V. B. D. Mech. Eng. III. F.
Thur.	Mining I. A.	Gen. Eng. I. A. Mech. Eng. II. D.F.G.J. Rail. Eng. I. E.	Geology III. A.C. Hyd. Eng. I. E.J.F.H.	Ore Dressing A. Mech. Eng. IV. F. Elec. Eng. II. G.J.	Gen. Eng. III. D.E.F.G.J. Quant. Analysis B.C.	Gen. Eng. III. D.E.F.G.J. Quant. Analysis B.C.	Chem. VI. (a) B.D. Chem. VII. (b) B.D. Surveying V. E.	Surveying V. E.
Friday.		Thermo. I. (a) A.E.F.G.J. Elec. Eng. I. (b) A.D.E.F.G.J. Chem. XIII. B.C.D.	Geology IV.(a) A.B.C. Geology II.(b) C. Mech. Eng. II. D.F.G.J.	Surveying IV. A.E. Mech. Eng. I. D.F.G.	Mec. Eng. III D.F. Elec. Eng. III. G.J. Quant. Anal. A.B.C.	Mech. Eng. III. D. F. Elec. Eng. III. G.J. Quant. Analysis A.B.C.	Mech. Eng. III. D.F. Elec. Eng. III. G.J. Quant. Analysis A.B.C.	Meeting of Engineering Society.
Sat.	Eng. Field Work II. E. Assaying (b) A.B.C. Quant. Analysis (a) A.B.C.	Eng. Field Work II. E. Assaying (b) A.B.C. Quant. Analysis (a) A.B.C.	Eng. Field Work. II. E. Assaying (b) A.B.C. Quant. Analysis (a) A.B.C.	Eng. Field Work. II. E. Assaying (b) A.B.C. Quant. Analysis (a) A.B.C.				

(a). Denotes First Term. (b). Denotes Second Term. A.B.C.D.E.F.G.H.J. Denote Courses.

TIME TABLE.

Fourth Year.

	VIII.	IX.	X.	XI.	I.	II.	III.	IV.
Mon.		Mining II. A. Chemistry XIV. B.D.G. Munic. Eng. E.H. Mechan. Eng. V. F.	Metallurgy II. A.B.D. Rail. Eng. II. E. Elect. Eng. IV. F.G.J.	Mech. Eng. IV. A.D.E.F.G.J. Geology VI. C.		Gen. Eng. II. A. Hyd. Eng. IV. E.	Chem. VI. A. Gen. Eng. V. E.J. Chem. VII. (b) D.	Economics A.B.C.D.E.F.J.
Tues.		Metallurgy II. A.B.D. Struct. Eng. III. E.J.	Hyd. Eng. III. E.J. Hyd. Eng. I. A.F.G.	Geology VIII. A.C. Munic. Eng. E.H. Elec. Eng. IV. F.G.J.	Mining II. A. Metallurgy IV. A. Mech. Eng. VI. F.	Mining IV. A. Hyd. Eng. II. E. Metallurgy IV. A. Elec. Eng. V. G.J. Mech. Eng. VI. F.	Rail. Eng. II, III. E. Mining IV. A. Metallurgy IV. A. Elec. Eng. V. G.J. Mech. Eng. VI. F.	Rail. Eng. II, III. E. Metallurgy IV. A. Elec. Eng. V. G.J. Mech. Eng. VI. F.
Wed.	Min. VI. A.B.C.	Mining II. A. Thermo. III. F.G. Struct. Eng. II. E.J.	Gen. Eng. II. A. Chemistry XIV. B.D.G. Munic. Eng. E. H.	Geology VIII. A.C. Rail. Eng. III. E. Mech. Eng. V. F. Elec. Eng. V. G.J.	Metallurgy III. A.D. G(b). Mining IV. A. Struct. Eng. II. E.J. Mech. Eng. VI. F. Gen. Eng. IV. E.J.	Metallurgy IV. A. Mining IV. A. Struct. Eng. II. E.J. Elec. Eng.VI. G. Mech. Eng. VI. F.	Metallurgy IV. A. Mining IV. A. Elec. Eng. VI. G. Mech. Eng. VI. F. Quan. Anal. E.	Elec. Eng. VI. G. Mech. Eng. VI. F. Quan. Anal. V. E.

FOURTH YEAR.—*(Continued.)*

	VIII.	IX.	X.	XI.	I.	II.	III.	IV.
THUR.		Metallurgy II. A.B.D. Geology IX. E (a). Thermo. III. F.G.	Hyd. Eng. I. A.F.G. Rail. Eng. III. E.	Mech. Eng. IV. A.D.E.F.G.J. Geology VI. C.	Mining III. A. Elec. Eng. VI. G. Mech. Eng. VI. F.	Struct. Eng. III. E.J. Elec. Eng. VI. G. Mining III. A. Mech. Eng. VI. F.	Chem. VI. (a). A. Chem. VI. (b). D. Elec. Eng. VI. G. Struct. Eng. III. E.J. Mech. Eng. VI. F.	Metallurgy IV. A. Elec. Eng. VI. G. Struct. Eng. III E.J. Mech. Eng. VI. F.
FRIDAY.	Milling A. Eng. Field Work III. E.J.	Mech. Eng. VI. F. Milling A. Eng. Field Work III. E.J. Elec. Eng. IV. G.	Milling A. Eng. Field Work III. E.J. Elec. Eng. IV. G.	Geology VII. C. Milling A. Eng. Field Work III. E.J. Elec. Eng. IV. G.	Milling A. Mech. Eng. VI. F.	Milling A. Mech. Eng. VI. F, Elec. Eng. VI. G. Gen. Eng. IV. E.	Milling A. Mech. Eng. VI. F. Elec. Eng. VI. G. Gen. Eng. IV. E.	Meeting of Engineering Society.
SAT.	Milling A. Thermo. III. F.G.	Mun. Eng. E. Milling A. Thermo. III. F.G.	Mun. Eng. E. Milling A. Thermo. III. F.G.	Milling A. Thermo. III. F.G.				

(a.) Denotes First Term. (b). Denotes Second Term. A.B.C.D.E F.G.H.J. Denote Courses.

JUNIOR MATRICULATION EXAMINATIONS.

SEPTEMBER, 1908.

		9 a.m.	2 p.m.
Thursday,	17th Sept.	—English Composition.	English Literature.
Friday,	18th "	—History.	Geometry.
Monday,	21st "	—Physics.	
Tuesday,	22nd "	—Arithmetic.	Algebra.
Saturday,	26th "	—Chemistry.	English Grammar.

Time table for Supplementary examinations in September will be issued first week in September.

FACULTY.

Nathan F. Dupuis, M.A., F.B.S., F.R.S.C.—Professor of Mathematics and Dean of Faculty.
William L. Goodwin, B.Sc. (Lond.), D.Sc. (Edin.), F.R.S.C.—Professor of Chemistry and Director of School of Mining.
William Nicol, M.A.—Professor of Mineralogy.
W. G. Miller, B.A.—Professor of Geology and Petrography.
L. W. Gill, M.Sc.—Professor of Electrical Engineering.
Stafford Kirkpatrick, M.Sc.—Professor of Metallurgy.
.....—Professor of Geology and Petrography.
A. L. Clark, Ph.D.—Professor of Physics.
J. C. Gwillim, B.Sc.—Professor of Mining Engineering.
D. H. Marshall, M.A., F.R.S.E.—Emeritus Professor of Physics.
N. R. Carmichael, MA.—Associate Professor of Physics
A. K. Kirkpatrick, C.E.—Professor of Civil Engineering.
Alexander Macphail, B.Sc.—Professor of General Engineering.
John Waddell, B.A., D.Sc., Ph.D.—Assistant Professor of Chemistry.
F. O. Willhofft, M.E., M.A.—Professor of Mechanical Engineering.
L. A. H. Warren, M.A.—Lecturer on Applied Mathematics.
W. C. Baker, M.A.—Lecturer on Physics.
C. W. Dickson, M.A., Ph.D.—Lecturer on Chemistry.
M. B. Baker, B.A., B.Sc.—Lecturer on Mineralogy, Geology.
W. O. Walker, M.A.—Lecturer in Organic Chemistry.
E. W. Henderson, B.Sc.—Lecturer in Electrical Engineering.
Lindsay Malcolm, M.A., B.Sc.—Lecturer in Civil Engineering.
G. J. McKay, B.Sc.—Assistant in Mining and Metallurgy.
J. Waddell, B.A., D.Sc., Ph.D.—Librarian.
Geo. Y. Chown, B.A.—Secretary-Treasurer.

Demonstrators.

Chemistry—D. R. Cameron, M.A.; F. L. Sine, M.A.; M. R. Bow; C. W. Drury, Wyatt Malcolm, M.A.; W. P. Firth, M.A., D.Cs.

Physics—J. C. Pomeroy, B.A.; H. B. Stillwell; W. P. Ferguson; M. LL. Cornell, M.A.; H. A. Kingston.

Professors of Queen's University whose classes are attended by Students of the School of Mining.

English.....Jas. Cappon, M.A., J. Marshall, M.A.
Botany.....W. T. McClement, M.A.
Animal Biology.....A. P. Knight, M.A., M.D.
German.....John Macgillivray, Ph.D. (Leipsic).
French.....P. G. C. Campbell, B.A. (Oxon).
Mathematics.....J. Matheson, M.A.
Economics.....A. Shortt, M.A., O. Skelton, M.A.

ARTICLE I.—ANNOUNCEMENT.

1. The School of Mining is a branch of the *School of Mining and Agriculture,* incorporated by Act of the Legislature of Ontario. It is affiliated to Queen's University, which confers all degrees.

2. Objects—The objects of the School of Mining are to give a thorough scientific education, both theoretical and practical, to men studying for the profession of the mining, civil, electrical, mechanical, chemical, or sanitary engineer, the assayer, the consulting geologist, and the metallurgist; and to provide for prospectors, mine foremen, and others interested in the discovery and winning of minerals, such instruction as shall make their occupations more interesting and less liable to failure.

3. Situation—The School has been placed near Queen's University so as to take advantage of the instruction therein provided in Mathematics, English, French, German, and the economic and biological sciences. It is in this way possible to equip and carry on a first-class technical school on a much smaller revenue than would otherwise be called for to maintain the high standard of scholarship which the age demands of the engineering profession.

Kingston is well situated as the seat of a Mining School. Geology and mineralogy, two of the fundamental subjects of a mining engineer's education, are studied to best advantage where the minerals can be seen as they lie in nature, and where geological formations can be examined *in situ.* In a few hours a class of students can be taken by carriage to a region so rich in mineral species that about forty different kinds have been secured in an afternoon. There is also a great variety of geological formation within easy access. If to this be added the neighborhood of mines in process of development or in operation, the result is an ideal Mining School city. The German Government has planted its mining schools in such cities, where the education of the mining engineer can be given that practical turn which not only lends a charm to the period of his study but shortens the time between graduation and thorough efficiency and confidence in the practice of his profession. The possibilities of the country to the north of Kingston are, in these respects, very great, and a glance at a geological map shows that the city itself is situated where the mineral-bearing formations, cutting like a broad

wedge through the limestone, reach the St. Lawrence and Lake Ontario. The region of mineral-bearing rocks is thus brought almost to the city. On either side, the water front is bordered by a band of limestone, broadening as it extends east and west.

Kingston is also the centre of navigation for Ontario. The Locomotive Works, which are the largest locomotive shops in Ontario, the Dry Dock, the Rideau Canal, and the numerous water powers in the district, offer advantage for the students in Civil, Electrical and Mechanical Engineering.

4. Expenses of a Course—The following statement of expenses is made from information obtained from students who have kept an account of their expenditures. Personal expenses are not included in the estimates. The average expense for class fees is taken in this estimate.

FOR EACH SESSION.

Board, lodging and washing	$98 00	to	$150 00
Books and Stationery	15 00	"	25 00
Incidentals	9 00	"	14 00
Excursions (geology, mineralogy and mining)	8 00	"	12 00
Class and other fees	85 00	"	85 00
	$215 00		$286 00

These estimates are based on board, etc., at from $3.50 to $5 per week, at which rates good board can be had in Kingston.

The fee for graduation is not included in the estimate.

ARTICLE II.—REQUIREMENTS FOR ADMISSION.

1. The Classes in the School of Mining are open to all, but those who are proceeding to a diploma or a degree are required to pass the Matriculation examination or an equivalent thereto before being admitted to examinations leading to a diploma or degree, and must follow one of the courses hereafter mentioned.

1. Having matriculated in any University in the British Empire or the United States.

II. Matriculation—The following are the conditions of Matriculation:—

2. Having passed the Junior Leaving or Junior Matriculation Examination of the Department of Education of Ontario or equivalent examinations in any other Province, in English Grammar, Composition and Literature, Arithmetic, Algebra and Geometry, History of Great Britain and Canada, Physics and Chemistry. The Matriculation examinations may also be taken in Queen's University in September. Other examinations will be accepted, so far as they are equivalent.

Note—Equivalent examinations in the different Provinces are:

Ontario	Junior Leaving.
Prince Edward Island	Second Class.
Nova Scotia	Grade XI.
New Brunswick	Second Class.
Quebec	Academy Grade III.
	University School AA.
Manitoba	Second Class.
Saskatchewan	Grade VII.
Alberta	Grade VII.
British Columbia	Intermediate.

3. Candidates who offer for matriculation any conditions other than (1) or (2) will forward to the Secretary, for the consideration of the Faculty, their applications accompanied by certificates and information.

4. In 1910 and thereafter the matriculation requirements will be the Ontario Departmental Matriculation in the subjects of English Grammar and Composition, English Literature, Arithmetic, Algebra and Geometry, History (British and Canadian), together with any three of the following: Latin, Greek, French, German, and Experimental Science.

5. Students who have already taken, in a university arts or science faculty or in a recognized technical or military school, subjects included in a degree course in the School of Mining will, on entering upon a course for the degree of B.Sc., be admitted to the year for which they are qualified.

III. Special Students—Students not proceeding to a degree may take any classes for which they are prepared. The work in Chemistry, Mineralogy, Geology, Drawing, Surveying, etc., is so arranged that those who wish to study these subjects, either for their scientific interest or as leading to professions other than engineering, may profitably pursue their studies here.

Special rates for students attending Queen's University or the School of Mining.

Territory—Between any station on the Canadian Pacific Railway, the Grand Trunk Railway, and the Intercolonial Railway in Canada and Kingston, either direct or over any one of the other lines, where the one-way regular first-class rate is $20 or more.

Condition—If any student is coming to attend Queen's College, or the School of Mining *for the first time*, a certificate to that effect will be accepted from parent, guardian, clergyman or magistrate. Subsequently going or returning from Kingston, certificates must be signed by the Registrar of the University.

Rate—One-way continuous passage tickets will be issued at half the regular, first-class one-way rate, *minimum rate to be charged*, $20. *For example, if the first-class one-way rate is* $50, $25 *will be charged, but if the one-way rate is less than* $40, $20 *will be collected.*

ARTICLE III.—SUBJECTS OF MATRICULATION REQUIRED BY THE SCHOOL OF MINING.

English.

Grammar and Rhetoric: The main facts in the development of the language.Etymology and syntax, including the logical structure of the sentence and the inflection, classification and elementary analysis of words. The rhetorical structure of the sentence and paragraph.

One examination paper.

Composition: An essay on one of several themes set by the examiners. In order to pass in this subject, legible writing, correct spelling and punctuation, and proper construction of sentences are indispensable. The candidate should also give attention to the structure of the whole essay, the effective ordering of the thought, and the accurate employment of a good English vocabulary. About two pages of foolscap is suggested as the proper length for the essay, but quality, not quantity, will be mainly regarded.

One examination paper.

Literature: Such questions only shall be set as may serve to test the candidate's familiarity with, and intelligent and appreciative comprehension of, the prescribed texts. The candidate will be expected to have memorized some of the finest passages. In addition to questions on the prescribed selections, others shall be set on a "sight passage" to test the candidate's ability to interpret literature for himself.

One examination paper.

1909: Coleridge, The Ancient Mariner; Wordsworth, Michael, Influence of Natural Objects, Nutting, Expostulation and Reply, The Tables Turned, The Solitary Reaper, Ode to Duty, Elegiac Stanzas, To the Rev. Dr. Wordsworth, "She was a Phantom of Delight," To the Cuckoo, The Green Linnet, "Bright flower! whose home," To a Skylark, ("Ethereal minstrel! pilgrim of the sky!"), Reverie of Poor Susan, To my Sister, "Three years she grew in sun and shower," September, 1819, Upon the same Occasion. The following twelve sonnets: "A flock of sheep that leisurely," "Earth hath not anything," "It is not to be thought of," "Fair star of evening," "O friend! I know not," "Milton! thou shouldst," "When I have borne in memory," "Brook! whose society," "Tax not the royal saint," "They dreamt not of a perishable home"; Shakespeare, Merchant of Venice.

1910: Tennyson, Ode to Memory, The Dying Swan, The Lotus Eaters, Ulysses, "You ask me why," "Of old sat Freedom," "Love thou thy land," "Tears, idle tears," and the six interlude songs from the Princess: The Brook, Ode on the Duke of Wellington, Charge of the Light Brigade, Enoch Arden; Shakespeare, Julius Cæsar.

History.

Great Britain and Canada from 1763 to 1885, with the outlines of the preceding periods of British History.

The geography relating to the history prescribed.

One half examination paper.

Mathematics.

Arithmetic: Elementary rules, fractions (vulgar and decimal), contracted methods of computation, square root, interest, discount, commission, insurance, stocks and exchange.

Mensuration: The rectangle, the parallelogram, the triangle, the circle, the parallelopiped, the prism, and the Cylinder.

One examination paper.

Note.—The problems proposed at this examination will be simple and direct, and in their solution neatness and accuracy will be insisted on.

Algebra.—Elementary rules; highest common measure; lowest common multiple; fractions; square root; simple equations of one, two and three unknown quantities; indices; surds; quadratics of one and two unknown quantities.

One examination paper.

Geometry: A.—Constructions.

To construct a triangle with sides of given lengths.

To construct an angle equal to a given rectilineal angle.

To bisect a given angle.

To bisect a given straight line.

To draw a line perpendicular to a given line from a given point in it.

To draw a line perpendicular to a given line from a given point not in the line.

Locus of a point equidistant from two given lines.

Locus of a point equidistant from two given points.

To draw a line parallel to another, through a given point.

To divide a given line into any number of equal parts.

To describe a parallelogram equal to a given triangle and having an angle equal to a given angle.

To describe a parallelogram equal to a given rectilineal figure, and having an angle equal to a given angle.

On a given straight line to describe a parallelogram equal to a given triangle, and having an angle equal to a given angle.

To find the centre of a given circle.

From a given point to draw a tangent to a given circle.

On a given straight line to construct a segment of a circle containing an angle equal to a given angle.

From a given circle to cut off a segment containing an angle equal to a given angle.

In a circle to inscribe a triangle equiangular to a given triangle.

To find locus of centres of circles touching two given lines.

To inscribe a circle in a given triangle.

To describe a circle touching three given straight lines.

To describe a circle about a given triangle.

About a given circle to describe a triangle equiangular to a given triangle.

To divide a given line similarly to another given divided line.

To find the fourth proportional to three given lines.

To describe a polygon similar to a given polygon, and with the corresponding sides in a given ratio.

To find the mean proportional between two given straight lines.

To construct a polygon similar to a given polygon, and such that their areas are in a given ratio.

To describe a polygon of a given shape and size.

B.—Theorems.

The sum of the angles of any triangle is equal to two right angles.

The angles at the base of an isosceles triangle are equal, with converse.

If the three sides of one triangle be equal, respectively, to the three sides of another, the triangles are equal in all respects.

If two sides and the included angle of one triangle be equal to two sides and the included angle of another triangle, the triangles are equal in all respects.

If two angles and one side of a triangle be equal to two angles and the corresponding side of another, the triangles are equal in all respects.

If two sides and an angle opposite one of these sides be equal, respectively, in two triangles, the angles opposite the other pair of equal sides are either equal or supplemental.

The sum of the exterior angles of a polygon is four right angles.

The greater side of any triangle has the greater angle opposite it.

The greater angle of any triangle has the greater side opposite it.

If two sides of one triangle be equal respectively to two sides of another,

The greater angle of any triangle has the greater side opposite it.

that with the greater contained angle has the greater base, with converse.

If a transversal fall on two parallel lines, relations between angles formed, with converse.

Lines which join equal and parallel lines towards the same parts are themselves equal and parallel.

The opposite sides and angles of a parallelogram are equal and the diagonal bisects it.

Parallelograms on the same base, or on equal bases, and between the same parallels are equal.

Triangles on the same base, or on equal bases, and between the same parallels are equal.

Triangles equal in area, and on the same base, are between the same parallels.

If a parallelogram and a triangle be on the same base, and between the same parallels, the parallelogram is double the triangle.

Expressions for area of a parallelogram, and area of a triangle.

The complements of the parallelogram about the diagonal of any parallelogram are equal.

The square on the hypotenuse of a right-angled triangle is equal to the sum of the squares on the sides.

If a straight line be divided into any two parts, the sum of the squares on the parts, together with twice the rectangle contained by the parts, is equal to the square on the whole line.

The square on a side of any triangle is equal to the sum of the squares on the other two sides + twice the rectangle contained by either of these sides and the projection of the other side on it.

If more than two equal straight lines can be drawn from the circumference of a circle to a point within it, that point is the centre.

The diameter is the greatest chord in a circle, and a chord nearer the centre is greater than one more remote. Also the greater chord is nearer the centre than the less.

The angle at the centre of a circle is double the angle at the circumference on the same arc.

The angles in the same segment of a circle are equal, with converse.

The opposite angles of a quadrilateral inscribed in a circle are together equal to two right angles with converse.

The angle in a semicircle is a right angle; in a segment greater than a semicircle less than a right angle; in a segment less than a semicircle greater than a right angle.

A tangent is perpendicular to the radius to the point of contact; only one tangent can be drawn at a given point; the perpendicular to the tangent at the point of contact passes through the centre; the perpendicular from centre on tangent passes through the point of contact.

The angles which a chord drawn from the point of contact makes with the tangent, are equal to the angles in the alternate segments.

The rectangles under the segments of intersecting chords are equal.

If $OA.OB. = OC^2$, OC is a tangent to the circle through A, B and C.

Triangles of the same altitude are as their bases.

A line parallel to the base of a triangle divides the sides proportionally, with converse.

If a vertical angle of a triangle be bisected, the bisector divides the base into segments that are as the sides, with converse.

The analogous proposition when the exterior angle at the vertex is bisected, with converse.

If two triangles are equiangular, the sides are proportional.

If the sides of two triangles are proportional, the triangles are equiangular.

If the sides of two triangles about equal angles are proportional, the triangles are equiangular.

If two triangles have an angle in each equal, and the sides about two other angles proportional, the remaining angles are equal or supplemental.

Similar triangles are as the squares on corresponding sides.

The perpendicular from the right angle of a right-angled triangle on the hypotenuse divides the triangle into two which are similar to the original triangle.

In equal circles angles, whether at the centres or circumferences, are proportional to the area on which they stand.

The areas of two similar polygons are as the squares on corresponding sides.

If three lines be proportional, the first is to the third as the figure on the first to a similar figure on the second.

Questions and easy deductions on the preceding constructions and theorems.

It is recommended that the study of formal demonstrative Geometry be preceded by a course in Practical Geometry, extending over not more than a year, and embracing the following:

Definitions; fundamental geometric conceptions and principles; use of simple instruments, as compasses, protractor, graduated rule, etc.; measurement of lines and angles, and construction of lines and angles of given numerical magnitude; accurate construction of figures; some leading propositions in plane geometry reached by induction as a result of accurate construction of figures; deduction also employed as principles are reached and assured. At the examination questions may be given in Practical Geometry, the constructions being such as naturally spring from the prescribed course. Candidates must provide themselves with a graduated ruler, compasses, set-square and protractor.

In the formal deductive Geometry, modifications of Euclid's treatment of the subject will be allowed, though not required, as follows:—

The employment of the "hypothetical construction."

The free employment of the method of superposition, including the rotation of figures about an axis, or about a point in a plane.

A modification of Euclid's parallel postulate.

A treatment of ratio and proportion restricted to the case in which the compared magnitudes are commensurable.

One examination paper.

Elementary Experimental Science.

Physics: Use of the mentre rule; use of calipers and vernier for more accurate metric measurements (*e.g.*, diameters of wires, thickness of glass, plates, etc.); numerical calculations, in the metric system.

Use of balance.

Specific gravity, by specific gravity bottle and hydrostatic balance, of liquids and of solids.

Boyle's law; barometer; diffusion of gases.

Use of Fahrenheit and centigrade thermometers; determination of zero and boiling point; boiling point dependent on pressure.

Expansion of solids, liquids and gases, examples.

Specific heat; latent heat; easy numerical examples.

Transmutation of matter; indestructibility of matter.

Solution, precipitation, crystallization and evaporation.

One half examination paper.

Chemistry: Properties of hydrogen, chlorine, oxygen, sulphur, nitrogen, carbon and their different compounds, especially those of economic and industrial importance. Mixtures, solutions, chemical compounds, elements, nomenclature, laws of chemical combinations, *e.g.*, combining weights, chemical formulæ and equations, with easy numerical examples.

ARTICLE IV.—SCHOLARSHIPS AND PRIZES.

EXHIBITION OF 1851 SCIENCE RESEARCH SCHOLARSHIP.

1. This scholarship, of the annual value of £150 stg., is awarded by Her Majesty's Commissioners for the Exhibition of 1851 to students who have given evidence of capacity for original research, and (except in very special circumstances) are under 30 years of age.

The nominee must be a British subject, must have been a *bona fide* student of Queen's University for three years, must have been a student of this University for a full year immediately before his nomination, cust be a student of the University at the time of his nomination, must be a student of the University at the time of his a full year ending within twelve months prior to his nomination and since ceasing to be such student must have been engaged solely in scientific study) and must pledge himself not to hold any position of emolument whilst holding the scholarship. He is recommended to the commisisoners by the Senate of the University. The scholarship may be held for a second year, if the report of the first year's work be satisfactory to the Commissioners. The scholar will, in the absence of special circumstances, be required to proceed to an institution other than that by which he is nominated, and there pursue some investigation likely to promote technical industries or scientific culture. The particular investigation the student proposes to pursue must be stated before a scholarship can be awarded.

The next recommendation will be made by the Senate in April, 1909.

Science Research Scholars recommended by Queen's University:—

Norman R. Carmichael, M.A., 1893-94.

Thomas L. Walker, M.A , 1895-6.

Frederick J. Pope, M.A., 1897-8.

Wm. C. Baker, M.A., 1900-1.

C. W. Dickson, M.A., 1901-2-3.

C. W. Knight, B.Sc., 1904-5.

F. H. MacDougall, M.A., B.Sc., 1905.

C. Laidlaw, B.A., M.D., 1907.

2. The Chancellor's Practical Science Scholarship.—Value $70. Given by Sir Sandford Fleming, C.E., K.C.M.G., LL.D., Chancellor of the University. Awarded to the Practical Science student passing the best examination at the end of the first year.

3. Mowat Scholarship.—Value $50. Given by Ex-Mayor Mowat. Awarded to the Practical Science student who obtains the highest standing in the second year in Mathematics II, Physics II and Sr. Chemistry.

4. Canadian Mining Institute Prizes.—The Canadian Mining Institute offers annually a medal and two prizes of a value of $25 each for papers by Canadian Mining students, and one of these prizes is offered for each of the three following groups of subjects:

Group I. Ore Deposits and Mining Geology.

The subject may be treated generally, or some particular district or single deposit may be discussed or described.

Group II. Mining Practice.

Any branch of mining may be treated, such as pumping, hoisting, ventilation, timbering, ore extraction, development, etc., etc., or some particular method of mining, or some individual mine or group of mines, may be described or discussed.

Group III. Ore Dressing and Metallurgy.

Any branch of ore dressing or metallurgy may be treated, as for example—crushing, jigging, milling, concentrating, smelting, roasting, cyaniding, etc.; or some particular plant may be described or discussed.

The titles of papers submitted in competition must be in the hands of the Secretary at least two weeks before the annual meeting, *i.e.*, in the second week of February in each year, and the finished papers must be in his hands before the first session of that meeting. These papers will be submitted by the Secretary to the Council in time for that body to decide whether any or all shall be read at any of the sessions of the annual meeting.

The Council shall appoint a Committee to determine the comparative merit of the several papers and to award the prizes for the year.

This Committee shall consist of three members of the Council, and it shall be required to judge the papers in accordance with the following rules and to report its findings in time to have them stated in the annual volume, which volume shall also contain the prize papers and any other papers which the Council consider sufficiently meritorious.

Each paper must show all quotations in inverted commas, and must credit all information obtained from books to the proper authorities: similarly all illustrations which are not original must be so marked, and due credit must be given in the text.

All papers must be legibly written on one side only of commercial letter paper, with all formulæ, etc., on separate lines or clearly distinct from the letterpress, and all illustrations which are to be published must be either clear line drawings in black and white, or good sharp photographs. All papers submitted, whether awarded prize or not, become the property of the Canadian Mining Institute.

5. The Engineering Society of Queen's University offers two prizes of $15.00 and $10.00 for the two best papers on scientific subjects, by members of the society. These papers must be read before the society, and five papers, at least, must be presented before the prizes will be awarded. These prizes are open for competition to all students of Engineering.

ARTICLE V.—REGULATIONS.

N.B.—Students taking a regular course are subject to all rules and regulations immediately upon publication, unless otherwise specified.

1. Examinations.—All examinations for degrees are held under the direction of Queen's University, requirements for pass standing being 40 per cent., and candidates must make application on forms supplied by the Registrar. Sessional Examinations are held in all the subjects prescribed in the various courses. In determining a student's standing at a sessional examination the professors in the different departments are empowered to take into account a student's entire class record. Examination fees must be paid to the Registrar of the University not later than March 23rd for the April examinations, and September 1st for the supplemental examinations.

Matriculated students must take the April examinations in all subjects in which they are registered and in which these examinations are held. Failure in more than four classes including practical classes in which no written examinations are held, involves the loss of the session. A student failing in not more than four classes is given Supplemental examination in the following September; if he fails in more than two of these examinations he must repeat the whole work of the year except those subjects in which his standing is second division (55 p.c.) or higher. A student shall not enter the

third year until he has passed all the examinations of the first year; nor the fourth year until he has passed all the examinations of the second year. In this connection each of the three sections of Mathematics I counts as one class, each of the two sections of Mathematics II as one class, and each of the two sections of Physics I as one class, and all other classes count as one each.

2. Attendance—Students are required to attend 80 per cent. of class lectures before permission will be given to write on examinations and 80 per cent. of Laboratory hours before laboratory work will be certified. Exemption from this rule can be obtained only on application to the Faculty.

3. Practical Work.—Students are required to take the practical courses given in the calendar unless they have followed similar courses in other educational institutions, but instructors may, at their discretion, modify the work in the case of students who have had experience in the field, in engineering works, &c. Such students may be set immediately at more advanced work than that required of those who have not had such experience.

4. Courses.—All students must take the subjects required in their courses in conformity with the calendars of their years of attendance. If a student wishes to change his course he must first obtain the permission of the Faculty.

5. Graduation.—Diplomas for the three years' course are given by the School of Mining, and application for same must be made to the Secretary, in writing, and the fees paid, before March 23rd. A candidate for a degree in one of the four years' courses must make application and pay the fees to the Registrar of the University before March 23rd. If the candidate fails in his examination the fees will be returned.

6. Graduation with Honours.—A student to graduate with Honours must enter the final year without back classes, and reach the first division (70 per cent.) in certain professional subjects which shall approximate half the work of the year, and must reach second division (55 per cent.) in all the other subjects of the year. Credit for Honour standing will be given on the diploma and a mark of distinction will be placed with the names of those graduating with honour standing in the list of graduates.

7. Extra-Mural Students.—Students who are not able to attend the School may register in the classes of Junior English, Junior and Senior Chemistry, Elementary Mineralogy and Geology, as extra-mural students of Queen's University (see Calendar of Queen's University, page 57). Tutors are appointed to assist them by correspondence.

8. The excursions are compulsory for all students in Geology, Mineralogy and Mining. (See Field Classes in Geology and Prospecting.)

9. Registration.—All students are required to register and pay the registration, athletic and class fees within ten days of the opening of the session. A student who fails to register within this time must pay an additional fee of $3.00. No student proceeding to a degree will be allowed to enter upon the work of a session after October 31st. Under special circumstances students may be admitted to the first year after October 31st.

10. Fees.—Laboratory fees must be paid before students begin work in the laboratories. Examination, degree graduation, *ad eundem statum*, and University registration fees, are payable to the University Registrar. All other fees are payable to the Treasurer of the School of Mining.

Registration for Practical Science Students	$10 00
" for Arts and Medical Students	1 00
Engineering Society	2 00
Athletics	3 00
Students failing to register within ten days of opening of session must pay an extra fee of	3 00
Change of classes after registration	2 00

Fees for a Course.

These fees cover all class and laboratory fees for the course.

Per Session $60 00

Students registered 1905-06 or previously will be required to pay a fee of only $50 per session.

Fees for Single Classes, &c.

These are not additional to the sessional fees.

Any course of Lectures	$12 00
Drawing, One Course, per Session	12 00
Surveying, One Course, per Session	12 00

Assaying Laboratory, per Session	5 00
Chemical Laboratory, per Session	15 00
Petrographical Laboratory, per Session	5 00
Mechanical and Engineering Laboratory, per Session	15 00

GRADUATION AND OTHER FEES.

Graduation B.Sc.	$20 00
" M.Sc.	20 00
" D.Sc.	50 00
" Diploma, three years' Course	10 00
Admission *ad eundem statum*	10 00
Annual Examination Fee	10 00

11. DEPOSITS.—For covering expenses of breakages, &c., a student must deposit $5 with the Treasurer. If at any time the amount of breakages, etc., exceeds $3, an additional deposit of $5 must be made. Charges will be made for the use of platinum, and special expensive chemicals, and apparatus. All money to the credit of the depositors will be returned at the end of the session on presentation of the deposit receipt properly certified.

ARTICLE VI.—DEGREES AND COURSES OF STUDY.

The following courses are offered:

1. Three years' courses for a diploma.

2. Four years' courses for the degree of Bachelor of Science (B.Sc.) in:

(A) Mining Engineering and Metallurgy.
(B) Chemistry and Mineralogy.
(C) Mineralogy and Geology.
(D) Chemical Engineering.
(E) Civil Engineering.
(F) Mechanical Engineering.
(G) Electrical Engineering.
(H) Sanitary Science.
(J) Power Development.

3. Six years' courses for the degrees of Bachelor of Arts and Bachelor of Science (B.A., B.Sc.).

4. A CANDIDATE FOR GRADUATION must have completed either a four or a six years' course and have passed all the required examinations.

5. CERTIFICATES of standing may be obtained on application to the Secretary.

6. The degree of Master of Science (M.Sc.) is granted to candidates who have graduated as B.Sc. and thereafter:—

a. Have practiced their profession for at least two years (one year of which must have been responsible engineering or scientific work.)

or b. Have spent at least one session in attendance after graduation as B.Sc.

In either case the candidate must have carried on research work, the results of which must be submitted, on or before March 30th, in the form of a thesis satisfactory to the Faculty. The literary as well as the scientific quality of the thesis is considered.

In addition to this, an examination is required, on subjects kindred to that treated of in the thesis. The candidate must give notice of his intention to proceed to the degree at least six months before he presents himself for examination, and must at the same time submit the subject of his research for approval. The subjects for examination will then be assigned by the Faculty.

7. The degree of Doctor of Science (D.Sc.) is granted to candidates who have graduated as M.Sc. or have otherwise satisfied the Faculty of their ability to proceed, and have thereafter fulfilled the conditions which here follow.

The degree is not granted until after at least three years from the time of graduation as M.Sc. unless one session is devoted to research in an approved university or school of engineering or applied science, in which case the degree may be granted at the end of two years from the time of graduation as M.Sc.

The candidate must submit a thesis embodying the results of his original and independent research in some subject of importance to science. The literary as well as the scientific quality of the thesis is taken into account in judging the candidate's fitness to proceed to the examination.

The candidate must make application in writing to the Secretary at least two years before he proposes to present himself for examination, and must at the same time submit the subject of his research for approval. The subjects of the examination, which will be cognate to that of the thesis, will then be assigned by the Faculty, and will include a reading knowledge of either Scientific French or German.

8. B.A. and M.A. courses in Chemistry, Assaying, Mineralogy, Geology, &c. (See Calendar of Queen's University, pages 61 and 69).

DOMINION LAND SURVEYORS.

The Diploma or Degree in Mining Engineering or in Civil Engineering of the School of Mining, Kingston, is equivalent to the "diploma as Civil engineer" mentioned in clause 111 of the Dominion Lands Act; so that a candidate for D.L.S. having that diploma from the School of Mining is entitled to examination after one year's service with a D.L.S.

ONTARIO LAND SURVEYORS.

The Ontario Land Surveyors' Act, 55 V. c. 34, s. 18, (28). "The privilege of a shortened term of appreticeship shall be accorded to any graduate of . . . . . the School of Mining, Kingston, in Civil Engineering, or in Mining Engineering, and such person shall not be required to pass the preliminary examination hereinbefore required for admission to apprenticeship with a land surveyor, but shall only be bound to serve under articles with a practicing land surveyor, duly filed as required by section 32 of this Act, during twelve successive months of actual practice, after which, on complying with all the other requirements, he may undergo the examination prescribed by this Act."

A.—MINING ENGINEERING AND METALLURGY.

In the course of Mining Engineering and Metallurgy some branches of study such as drafting, chemistry and surveying continue through each of the years. It is intended to give the student a sound knowledge and practice in these since they are the usual avenues of employment. The first year, in common with the other engineering courses, is intended to provide a firm foundation in Mathematics, Physics and Chemistry, together with Laboratory work. The second year continues to advance in these fundamental subjects and adds Mineralogy and Geology as special studies.

The third year is principally devoted to technical work in Mining and Metallurgy. An option is introduced for those who wish to specialize in Mining or Metallurgy. A practical course in fire and wet assaying is taken in the second term.

The fourth year takes up more advanced work in Mining and Metallurgy, also Hydraulics; and a considerable portion of the time is spent in designing and mill work. The mining or metallurgical options are continued, both leading to the same degree.

The degree of Bachelor of Science (B.Sc.) is awarded on the completion of this course, and the production of certificates for not less than three months' work in mines or metallurgical works.

First Year.

The letters (*a*) and (*b*) denote first and second term respectively. The numbers in brackets are the hours per week.

Second Year.

Third Year.

Mining Option.

Geology II, and III (5)	62
Chemistry XV (5)	55
Fire Assaying (4 *b*)	56

Metallurgy Option.

Geology III (2)	62
Chemistry XV, XVI (7)	55
Fire Assaying (4 *b*)	56

FOURTH YEAR.

Mechanical Engineering IV (2)	81
Metallurgy II (4)	70
General Engineering II (2)	73
Hydraulic Engineering I (2)	78
Mining II (3)	67
Economics (3 *a*)	86
Milling (11)	67

Mining Option.

Geology III (2)	62
Designing and Mining Project (5)	68
Mining III (1)	68

Metallurgy Option.

Chemistry VI (2)	53
Metallurgical Laboratory (5)	68
Metallurgy III (1)	71

B.—CHEMISTRY AND MINERALOGY.

This course is intended to prepare candidates to enter upon the practice of chemical analysis and assaying, to fit them for positions in the laboratories of metallurgical, mining, manufacturing and other works, and also for the offices of public analyst, of the chemical department of the Geological Survey, and for other positions where a knowledge of chemistry, including chemical analysis and assaying, and of mineralogy, is required. As the course covers also an advanced training in mathematics and physics, and two years' study in geology, the education implied by the four years' study is sufficiently broad to form a good introduction to any career where a scientific training is required. The first three years are occupied mainly with a study of the subjects mentioned, but the greater part of the time in the second and third years is devoted to chemistry, covering such theoretical subjects as chemical laws and theories,

organic chemistry and physical chemistry, and also the practical side as represented by qualitative analysis, preparation of organic compounds, industrial chemistry and quantitative analysis. In the third year the minute and careful study of mineral species which has been prepared for in the second year, is accompanied by work in the petrographical laboratory. The fourth year is devoted largely to special chemical analysis and assaying and to research work; but the important modern developments of physical chemistry, so fruitful practically, find a place in the advanced class in this subject. An original research in some chemical or mineralogical subject is carried on in this year. The research may deal with a subject purely chemical, or purely mineralogical, or may combine the two subjects. The results must be reported in the form of a thesis on or before April 1st, and the thesis must be adjudged satisfactory by the Faculty, as a condition for granting the degree.

First Year.

Same as first year Course A.

Second Year.

Physics II (4)	51
Chemistry II, III, IV, VIII, IX, X, XI (17)	53
Mineralogy I (3)	57
Mineralogy II (2)	58
Geology I (2)	61

Option I.

Mathematics II (6)	50

Option II.

Physics III (2)	51
Botany (Arts) (3) Botany (Science) (1½) Animal Biology (3)	See Arts Calendar.

Third Year.

Chemistry V, VI, VII, XIII, XV, XVI, XVII (20)	53
Mineralogy IV (5), VI (1)	59
Geology II and IV (2)	62
Fire Assaying (4 *b*)	56
Metallurgy I (2)	70

Fourth Year.

Metallurgy II (3)	70
Chemistry XIV (2)	55
Advanced Chemical Analysis and Assaying (10)	56
Research and Thesis (20)	
Economics (1)	86

C.—MINERALOGY AND GEOLOGY.

This course is designed to meet the requirements of students who desire a theoretical and practical knowledge of the constitution and history of the earth. It furnishes a foundation for the professions of mineralogist, geological surveyor, mining and consulting geologist, and is useful for those who will in any way be connected with the discovery or the development of the natural resources of the country. It forms a good preliminary course for the mining engineer who wishes to understand thoroughly the groundwork of his profession. Since a knowledge of chemistry is essential for proper comprehension of many mineralogical and geological phenomena, considerable stress is laid on this science in the earlier part of the course. The departments of mineralogy and geology are furnished with well equipped laboratories for the physical and chemical examination of minerals, rocks and ores, and also with collections of illustrative material. While field excursions are made during the session, students are advised to spend the summer vacations in practical field work.

First Year.

Same as first year Course A.

Second Year.

Option I.

Option II.

Third Year.

FOURTH YEAR.

Geology VI (2) 64
Geology VII (6) 64
Geology VIII (2) 65
Geol. and Min'l Labs. .....
Original Research, Thesis .....

D.—CHEMICAL ENGINEERING.

In the construction and operation of chemical works and also in metallurgical enterprises in which the processes are of the more complicated kind, there are often required the services of a man who combines a thorough knowledge of chemistry with the education of an engineer; but the chemical engineer must have at his command not merely the elements of general engineering, but also a competent knowledge of those materials of construction and the special kinds of plants and processes which are in use in the works mentioned. The course in chemical engineering covers four years of study, the first two of which do not differ materially from those of other engineering courses. Specialization begins in the third year, in which about half of the time is devoted to chemistry and metallurgy, and the remainder to the elements of mechanical and electrical engineering. Specialization is continued in the fourth year, which includes, in addition to advanced work in chemistry and metallurgy, subjects of electro-metallurgy and chemical engineering.

FIRST YEAR.

Same as first year Course A.

SECOND YEAR.

Mineralogy I (3) 57
Mathematics II (6) 50
Physics II (4) 51
Chemistry II, III, IV, VIII, IX (7) 53
General Engineering I (2) 85
Drawing II, III (6) 84
Descriptive Geomery (3) 83
Workshop II (4) 83

THIRD YEAR.

Mechanical Engineering VII (1) 82
Chemistry X, XI (10 *a*) 54
Chemistry XV, XVI (10 *b*) 55
Chemistry V, XIII (8) 54

Metallurgy I (2)	70
Thermodynamics I, II (2 *a*) (1*b*)	71
Mechanical Engineering I, III (15)	81
Electrical Engineering I (1 *a*) (2 *b*)	75
General Engineering II, and III (4)	72

FOURTH YEAR.

Chemistry XIV, XVII (4)	54
Chemistry VII (2 *b*)	53
Mechanical Engineering IV (2)	81
Metallurgy II, III, (4)	70
Economics (1)	86
Chemical Works and Engineering (5)	
Mining Laboratory (5)	
Fire Assaying (4 *b*)	56

E.—CIVIL ENGINEERING.

In this course the two main divisions of Civil Engineering, namely Surveying and Draughting, on the one hand, and Structural Design and Construction, on the other, receive full consideration. During the earlier years of the course a sound training along engineering lines is given in Mathematics, Physics, Mechanics and other allied subjects, which are essential to the proper education of an engineer. The student is also made familiar with the use of the various instruments, and by many hours of practical work in the field and draughting room, becomes skilled in the ordinary operations of Surveying. During the same period the foundation work for structural design is laid by courses of lectures in materials of construction, as well as by demonstrations and practical work in the testing laboratories. The third year is opened by a full month of Engineering Field Work, whereby the student is brought into contact with the problems of railway location, and hydrographic surveying. During the final years more highly specialized instruction and training are given along the lines of the two main divisions, with particular regard to the economic conditions of modern construction. At frequent intervals excursions are undertaken to the quarries, cement works, brick kilns, bridges, railway structures, canals and graving docks, which are to be found within easy distance of Kingston.

The subjects of instruction, number of hours per week devoted to each subject, and the page on which the syllabus is to be found, are indicated in the following table.

First Year.

Same as first year Course A.

Second Year.

Third Year.

Fourth Year.

F.—MECHANICAL ENGINEERING.

The aim of this course is to train the student to deal with the general problems of mechanical engineering.

The first two years are devoted to the study of the fundamental subjects of Mathematics, Physics, Chemistry and Mechanics, including experimental work in the various laboratories. Special attention is given to the subject of strength of materials, with practice in

testing during the second and third years. The study of the steam engine and other forms of heat-engines, taken in the third year, includes courses in Thermodynamics, Valve Gears, Governors and the subject of balancing of engines. Courses are also given in Mechanism, Machine Design, and the fundamental principles of Electrical Engineering. The advanced course in Machine Design of the fourth year has for its object the application of fundamental principles to the solution of problems in steam engine design. Instruction in drawing extends over the four years, and deals with the proper way to make necessary dimensioned drawings, tracings and the prints for use in practice.

Classes are taken in the workshop during the four years, with the object of giving the student a general idea of modern methods of machine construction rather than to make him a skilled mechanic and in this connection students are strongly advised to spend their vacations, or part of their vacations, in practical work in engineering works, because the experience thus gained will be invaluable to them in their later life, and it will also enable them to derive more benefit from the required studies. Practical instruction is given in the Mechanical Engineering Laboratories to drill the student in methods of carrying out experimental work, such as engine tests, boiler tests, etc. This work takes very largely the form of investigation. The fourth year students are kept in touch with the local manufacturing concerns in order to familiarize them with modern power plants.

First Year.

Same as first year Course A.

Second Year.

Mathematics II (6)	49
Physics II (4)	51
Chemistry III, IV, VIII, X (5)	53
Descriptive Geometry (3)	83
General Engineering I (2)	72
Drawing II, III, IV (9)	84
Workshop II (5)	86

Third Year.

General Engineering II, III (4)	73
Thermodynamics I, II (2 *a*) (1 *b*)	71
Mechanical Engineering I, II, III, IV, VII (14)	81
Electrical Engineering I (1)	75
Workshop III (4)	86

Metallurgy I (2) 70

Fourth Year.

Hydraulic Engineering I (2) 78
Thermodynamics III (6) 71
Mechanical Engineering IV, V, VI (20) 81
Workshop IV (4) 86
Economics (3 *a*) 86

G.—ELECTRICAL ENGINEERING.

The instruction in the first two years of the course in Electrical Engineering provides for a thorough training of the student in the fundamental subjects of Mathematics, Physics, Chemistry and Mechanics, including suitable work in the various laboratories. Part of the time is devoted to elementary drawing and shop work. In the third year the work consists of an introduction to the general principles underlying all electrical work together with elementary laboratory work. Considerable time is devoted to the study of Thermodynamics and advanced mechanical drawing. The fourth year is devoted to the study of the action and design of all kinds of electrical apparatus, the design and operation of central stations, electric lighting, electric railways and power transmission.

An important part of the work consists in the working out of problems such as are frequently met in practical work. In this way the student is trained in the application of theory to the solution of practical problems.

Arrangements are made for occasional visits to electrical works.

The whole course is designed to give the student a thorough understanding of the general principles which constitute the basis of all electrical work, together with a knowledge of how these principles are applied in practice. No effort is made to give that intimate knowledge of practical details which experience alone can supply.

First Year.

Same as first year Course A.

Second Year.

Mathematics II (6) 49
Physics II, III (6) 51
Chemistry III, IV, VIII, IX (5) 53

Descriptive Geometry (3)	83
General Engineering I (2)	72
Drawing II, III (6)	84
Workshop II (4)	86

THIRD YEAR.

General Engineering II, III (4)	73
Thermodynamics I, II (2 *a*) (1 *b*)	71
Mechanical Engineering I, II, VII (5)	81
Electrical Engineering I, II, III (9)	75
Physics IV (6)	51
Workshop III (4)	86
Metallurgy I (2)	70

FOURTH YEAR.

Hydraulic Engineering I (2)	80
Thermodynamics III (6)	71
Mechanical Engineering IV (2)	81
Electrical Engineering IV, V, VI (20)	76
Chemistry XIV (2)	55
Workshop IV (4)	86
Electro-Metallurgy (1 *b*)	71
Economics (1)	86

H.—SANITARY SCIENCE,

This course is intended to prepare students for a profession that is growing in importance every day. Sanitary Science may be defined as that branch of science concerned in the care and promotion of public health. In by-gone years the public health officer was necessarily a doctor of medicine, because he alone was supposed to be able to take care of the health of a community. But with the development of systems of water supply, gas supply, drainage, etc., it has become increasingly apparent that a public health officer must possess, in addition to his medical skill, at least an elementary knowledge of those branches of Practical Science which are concerned in planning, constructing and controlling these public utilities. In other words, a modern public health officer must be in part a trained medical man, and in part an engineer. He must on the medical side be familiar with bacteriology,, and with the manner in which contagious diseases are spread. Much of this knowledge is inseparably connected with the water supply, drainage system, the disposal of refuse and sewerage. To organize such works and control them in the interests of the public health of a community is the work of a Sanitary Engineer.

The course besides preparing students for the profession of Sanitary Engineer, will be found suitable for those who wish to combine a broad scientific course with the ordinary medical one. The two degrees of B.Sc., and M.D., may be taken in six years.

First Year.

Same as first year Course A.

Second Year.

Mathematics II (6)	49
Physics II (4)	51
Chemistry II, III, IV, VIII, IX and Urinalysis, etc. (10)	53
General Engineering I (2)	72
General Engineering II (2)	73
Animal Biology (3)	66
Mineralogy V (1) (*a*)	60
Geology I (2)	60
Botany (4)	66

Third Year.

Human Anatomy as for first year Medical Students (20)	See Med. Cal.
Physiology and Histology (3)	See Med. Cal.
Bacteriology (3)	See Med. Cal.
Junior Materia Medica (3)	See Med. Cal.
Quantitative Analysis (water, air, food) (5)	See Med. Cal.
Hydraulic Engineering I (2)	78

Fourth Year.

Human Anatomy; as for second year Medical Students (10)	See Med. Cal.
Final Honours in Animal Biology	See Med. Cal.
Senior Materia Medica and Pharmacy	See Med. Cal.
Pathology (3)	See Med. Cal.
Sanitary Science (2)	See Med. Cal.
Municipal Engineering (3)	77

Students taking this course and intending to study Medicine are advised to register in the Faculty of Medicine not later than the second session. Such students will pay the regular fee in Science, and in addition must arrange with the Medical Faculty regarding fees for Medical classes. After completing the above course, the Medical curriculum may be completed in two years' further study.

J.—POWER DEVELOPMENT.

The introduction of a course in Power Development has followed the demand for a course of studies which will prepare students to take up a branch of engineering which is really the basis of our modern industrial system. The substitution of machinery in the place of the skilled artisan in every department of industry within recent years has largely increased the demand for power. So great is this demand that every available source is being tapped,—the coal mine, the water fall, the oil well, the peat bog, and other minor sources.

The studies in the following courses have been selected with the view of giving first that broad training in fundamental subjects which is essential in fitting the student for any class of engineering work. For this reason the work of the first two years is much the same as in the other courses. In the third year considerable time is devoted to surveying and structural work, a knowledge of these being essential in the laying out of any scheme for the development of power. In the third and fourth years the student may specialize in the direction of hydro-electric work or in the direction of steam and gas. In the first case special attention is given to hydraulic engineering and surveying, while in the second case an equivalent amount of time is devoted to mechanical engineering, including the production of steam and gas.

(First 2 years same as Course E.)

Third Year.

Engineering Field Work I, Sept. 4th to Sept. 29th	74
Chemistry XII (2)	54
Electrical Engineering I, II, III (9*a*) (10*b*)	75
General Engineering II, III (4)	73
Thermodynamics I, II (2)	71
Hydraulic Engineering I (2)	78
Structural Engineering I (4)	80
Engineering Field Work II (4)	75
Mechanical Engineering II, VII (3)	81

Mechanical Engineering III may be substituted for Electrical Engineering III.

Fourth Year.

Chemistry XVIII (2)	55
Geology IX (1*a*)	65
General Engineering IV, V	74

Thermodynamics III and Mechanical Engineering V may be substituted for General Engineering IV, Geology IX, and Structural Engineering II, III.

HONOUR COURSES IN QUEEN'S UNIVERSITY IN CHEMISTRY MINERALOGY AND GEOLOGY.

The degree of M.A. will be conferred on students who take Pass standing in the Pass classes, and first class honours in the honour classes, in any one of the following courses.

The degree of B.A. will be conferred on candidates who take Pass standing in the Pass classes, and second or third class honours in the Honour classes of any of the following courses:

Pass Classes.

Junior English.	Nine.
Senior English.	
Junior Mathematics.	
Senior Mathematics.	
Mental or Moral Philosophy.	
Junior Physics.	
Senior Physics.	
Junior Chemistry.	
Senior Chemistry.	
Junior Latin.	Any two.
Senior Latin.	
Junior Greek.	
Senior Greek.	
Junior French.	
Senior French.	
Junior German.	
Senior German.	
Mental or Moral Philosophy.	

Honour Classes.

Preliminary and Final Honour Chemistry.	Any two.
Preliminary and Final Honour Geology.	
Preliminary and Final Honour Mineralogy.	

Specialists' Courses.

By agreement with the Education Department, candidates taking either the M.A. or B.A. degree under any one of the following Honour courses, who have made 66% on the Honour examinations and attended two sessions, will receive the non-professional qualification of Specialist in Science.

Junior Latin.
Junior French, German or Greek.
Junior and Senior English.
Junior and Senior Mathematics (Honour percentage 50 required).
Junior and Senior Physics (Laboratory practice in both).
Junior and Senior Chemistry.
Botany.
Animal Biology.
Mineralogy I.
Geology I.

Honour Classes.

Preliminary Honour Chemistry.
Preliminary Honour Botany.
Preliminary Honour Animal Biology.
Together with any one of the following groups:
(*a*) Final Honour Botany and Final Honour Animal Biology.
(*b*) Experimental Honour Physics and Final Honour Chemistry.
(*c*) Final Honour Chemistry and Preliminary and Final Honour Mineralogy.
(*d*) Preliminary Honour Mineralogy and Preliminary and Final Honour Geology.

Students intending to teach in Ontario are referred to the Calendar of the Ontario Normal College for information regarding professional examinations.

SIX YEARS' COURSES, B.A. AND B.Sc.

Students taking these courses are required to have Arts Matriculation and to register the first two years in Arts alone and pay the class and registration fees in Arts, to register the second two years in both Arts and Mining, to pay both registration fees and the Mining class fees and to register the last two years in Mining only, paying registration and class fees. Arts classes are subject to the regulations in the Arts Calendar and Mining classes to the regulations in the Mining Calendar.

A.—MINING ENGINEERING.

First Year.

Junior Latin.
Junior Greek.
Junior French.
Junior German.
} Any two

Junior English.
Mathematics I.
Physics I.

Second Year.

Senior English.
Junior Chemistry.

Mathematics II.
Physics II.

Mental Philosophy.
Senior Latin.
Senior Greek.
Senior French.
Senior German.
} Any one.

Third Year.

Economics.
Medieval History.
} Any one.

Workshop I.
Drawing I.

Senior Chemistry.
Mineralogy I.
Surveying I.

Fourth Year.

Geology I.
Preliminary Honour Chemistry.
Preliminary Honour Mineralogy.
Descriptive Geometry.
Surveying II.

General Engineering I.
Drawing II.
Workshop II.

Fifth Year.

Same as third year B.Sc. course.

Sixth Year.

Same as fourth year B.Sc. course.

D.—CHEMICAL ENGINEERING.

First Year.

Junior Latin.
Junior Greek.
Junior French.
Junior German.
} Any two

Junior English.
Mathematics I.
Physics I.

Second Year.

Senior English.
Junior Chemistry.

Physics II.
Mathematics II.

Mental Philosophy.
Senior Latin.
Senior Greek.
Senior French.
Senior German.
} Any one.

THIRD YEAR.

Economics.	Any one.	Workshop I.
Medieval History.		Drawing I.
Senior Chemistry.		Mineralogy I.
Surveying I.		

FOURTH YEAR.

Politics.	Any one.	Qualitative Analysis.
Moral Philosophy.		Workshop II.
Preliminary Honour Latin.		General Engineering I.
Preliminary Honour French.		
Preliminary Honour German.		Drawing II, III.
Intermediate Honour English.		Descriptive Geometry.

FIFTH YEAR.

Same as third year B.Sc. course.

SIXTH YEAR.

Same as fourth year B.Sc. course.

E.—CIVIL ENGINEERING.

FIRST YEAR.

Junior Latin.	Any two	Junior English.
Junior Greek.		Mathematics I.
Junior French.		Physics I.
Junior German.		

SECOND YEAR.

Senior English.		Mental Philosophy.
Junior Chemistry.		Senior Latin.
		Senior Greek. Any one.
Physics II.		Senior French.
Mathematics II.		Senior German.

THIRD YEAR.

Economics.	Any one.	Senior Chemistry.
Medieval History.		Mineralogy I.
Workshop I.		Surveying I.
Drawing I.		

FOURTH YEAR.

Geology I.
Drawing II.
Workshop II.
Descriptive Geometry.

Any one:
Politics.
Moral Philosophy.
Preliminary Honour Latin.
Preliminary Honour French.
Preliminary Honour German.
Intermediate Honour English.
General Engineering I.
Surveying II, III.

FIFTH YEAR.

Same as third year B.Sc. course.

SIXTH YEAR.

Same as fourth year B.Sc. course.

F.—MECHANICAL ENGINEERING.

FIRST YEAR.

Any two:
Junior Latin.
Junior Greek.
Junior French.
Junior German.

Junior English.
Mathematics I.
Physics I.

SECOND YEAR.

Any One:
Mental Philosophy.
Senior Latin.
Senior Greek.
Senior French.
Senior German.

Mathematics II.
Senior English.
Junior Chemistry.
Physics II.

THIRD YEAR.

Any one:
Economics.
Medieval History.

Senior Chemistry.
Mineralogy I.
Surveying I.
Workshop I.
Drawing I.

FOURTH YEAR.

Drawing II, III, and IV.
Descriptive Geometry.
Qualitative Analysis I, and III.
General Engineering I.

Any one:
Workshop II.
Politics.
Moral Philosophy.
Preliminary Honour Latin.
Preliminary Honour French.
Preliminary Honour German.
Intermediate Honour English.

FIFTH YEAR.

Same as third year B.Sc. course.

SIXTH YEAR.

Same as fourth year B.Sc. course.

G.—ELECTRICAL ENGINEERING.

FIRST YEAR.

Junior Latin. Junior Greek. Junior French. Junior German.	Any two	Junior English. Mathematics I. Physics I.

SECOND YEAR.

Senior English. Junior Chemistry. Physics II, and III. Mathematics II.		Mental Philosophy. Senior Latin. Senior Greek. Senior French. Senior German.
		Any one.

THIRD YEAR.

Economics. Medieval History.	Any one.	Senior Chemistry. Mineralogy I.
Workshop I. Drawing I.		Surveying I.

FOURTH YEAR.

Drawing II, III. Descriptive Geometry. Qualitative Analysis I, and III. Workshop II. General Engineering I.		Politics. Moral Philosophy. Preliminary Honour Latin. Preliminary Honour French. Preliminary Honour German. Intermediate Honour English.
		Any one.

FIFTH YEAR.

Same as third year B.Sc. course.

SIXTH YEAR.

Same as fourth year B.Sc. course.

SUBJECTS OF STUDY.

ENGLISH LANGUAGE AND LITERATURE.

PROFESSOR—James Cappon, M.A.
ASSISTANT PROFESSOR—John F. Macdonald, M.A.
TUTOR—A. W. Baird.

JUNIOR CLASS.

1. Practical course in Rhetoric and Composition.
   (*a*) General Theory and illustrations.
   (*b*) Exercises on the above, with essays.
2. Study of Prose Authors in selected passages. Development of English prose as illustrated by Bacon, Addison, Johnson, Macaulay, Ruskin, Carlyle, Huxley, Arnold, and others.

Text-book for this course: Model English Prose (Macmillan & Co.)

3. A detailed study in class of the following:

Chaucer, Prologue to Canterbury Tales. (The descriptions of the Knight, Squire, Prioress, Monk, Friar, Student, Merchant, Franklin, Doctor, Shipman, Parson).

Shakespeare, Julius Cæsar.

Longfellow, Prelude, Nuremberg, The Belfry of Bruges, The Skeleton in Armour, Amalfi, The Village Blacksmith, The Day is Done, The Secret of the Sea.

Tennyson, The Palace of Art, The Lady of Shalott, "Love Thou Thy Land," The Lord of Burleigh.

Wordsworth, Ruth, Fidelity, The Two Voices, Lines written near Tintern Abbey.

MATHEMATICS.

PROFESSOR—N. F. Dupuis, M.A., F.R.S.C.
ASSISTANT PROFESSOR—J. Matheson, M.A.
LECTURERS—L. A. H. Warren, M.A.; L. Malcolm, M.A., B.Sc.

MATHEMATICS I.

This class will meet for the study of Mathematics eight hours per week, of which one hour per week during the second term will be given to astronomy. The subjects of study are as follows: (1) Algebra, including the leading parts of the subject such as multiplication, division, expansion into series, fractions, indices and surds, proportion, graphing of functions, quadratic; together with permutations and combinations, binomial theorem, undetermined co-efficients, summation of series, continued fractions, logarithms, exponentials, etc.

(2) Elementary Geometry including the first three parts of Dupuis' Plane Geometry, together with the first 131 pages of Dupuis' Solid Geometry. Particular attention will be given to practical applications of geometric principles.

(3) Trigonometry, including the fundamental principles and formulæ with numerous exercises and applications. A great portion of the practical work will be done by means of natural functions. Nature and use of logarithms and tables, inverse functions and the first principles of spherical trigonometry. Three hours per week will be given to geometry and four and a half hours to the other two.

(4) Elements of descriptive astronomy, illustrated by the lantern and by models. One hour per week, second term.

In all these subjects exercises will be required.

MATHEMATICS II.

This class will meet for the study of mathematics six hours per week, and the subjects taken up will be as follows:

(1) Mensuration of volumes and surfaces—Pappus' theorem—spheric geometry.

(2) Spherical Trigonometry and Geodesy, with general theories of projection and perspective. Simple application to spherical astronomy.

(3) Co-ordinate Geometry of two and three dimensions with application to the conic sections and some of the more prominent curves.

(4) The Differential and Integral Calculus, with application to curves and curve tracing, graphing, lengths of lines, areas of surfaces, and volumes of solids, mean centre, moments of inertia, etc., approximate areas by equidistant ordinates.

Two hours will be given to (1) and (2) and four hours to (3) and (4).

PHYSICS.

Professor—Arthur L. Clark, Ph.D.
Associate Professor—N. R. Carmichael, M.A.
Lecturer—W. C. Baker, M.A.
Demonstrators—J. C. Pomeroy, B.A., M. L. Connell, M.A., G. Stillwell, B.A., W. P. Ferguson, H. R. Kingston, W. W. Doxsee.

PHYSICS I.

The work of this class consists of:—

(1) An elementary course of four lectures per week on General Physics, including the measurement and discussion of physical quantities, the fundamental principles of dynamics, their application to various practical problems, properties of matter, heat, light, sound, electricity and magnetism.

(2) Exercises and problems.

(3) Experimental work in the laboratory, two hours per week. Demonstrators are present to direct the manipulation of apparatus and to give necessary explanations. A record of all experiments performed is to be kept in a suitable note-book which must be left with the demonstrators for inspection during the Christmas vacation, for the week following the closing of the laboratory in March, and at such other times as may be announced.

Text-Books:—Carmichael's Physical Experiments, and other books to be prescribed at opening of session.

PHYSICS II.

(1) A course of two lectures per week in continuation of that given in Physics I. The principles of dynamics are developed and applied to problems dealing with statics, simple harmonic motion, the motion of a crank and connecting rod, friction, calculation of moments of inertia, rotation, elasticity, energy and its transformations, thermodynamics, and fluid motion.

(2) Exercises and problems.

(3) Experimental work in the laboratory, two hours per week.

PHYSICS III.

(1) Experimental study in the laboratory of certain phenomena of electricity and methods of measuring electrical quantities, two hours per week.

(2) Reading of prescribed parts of the text-book (to be prescribed), with occasional lectures upon selected topics.

PHYSICS IV.

(1) Lectures upon the mathematical theory of electricity and magnetism, one hour per week.

Text-Book:—J. J. Thomson's Elements of the Mathematical Theory of Electricity and Magnetism.

(2) Experimental measurement of electrical quantities in the laboratory, with lectures upon selected topics, five hours per week.

THE PHYSICAL LABORATORIES AND LIBRARY.

Two of the largest rooms are equipped as general elementary laboratories for the experiments performed by first and second year students. Six other rooms are fitted for special purposes. All have electric circuits connecting them with a switchboard so that currents of any desired nature may be used in experimental work in any of the rooms. Instruments of precision, such as ammeters,

voltmeters, electrometers, induction coils of various sizes, measuring microscopes, interferometer, potentiometer with accessories, spectrometer, galvanometers of various types, condensers, standards of resistance, self-induction, and capacity, are available for more advanced work.

The library contains text-books, works of reference, and journals devoted to Physics and related subjects. These may be freely consulted by the student in the reading room between the hours of 8 a.m. and 5 p.m. Books may in general be taken from the building overnight upon reporting to a member of the staff and making a record in a book provided for that purpose. It is only by special permission, however, that any book may be kept away longer than one night at a time.

CHEMISTRY.

Professor—W. L. Goodwin, D.Sc., F.R.S.C.

Assistant-Professor—John Waddell, B.A., D.Sc., Ph.D.

Lecturers—C. W. Dickson, M.A., Ph.D.; W. O. Walker, M.A.; A. R. B. Williamson, M.A., M.D.; Isaac Wood, M.A., M.D.; J. F. Sparks, B.A., M.D.

Fellow—W. P. Firth, M.A., D.Sc.

Demonstrators—D. R. Cameron, M.A.; F. L. Sine, M.A.; M. R. Bow; C. W. Drury.

I.

1. *Lectures* on the principles of Chemistry as follows:

Monday and Tuesday at 11 a.m.

Chemical Species; Crystals and Crystallisation; Chemical Change; Laws of Combination; Relation of Heat to Chemical Change; Notation; Equations, Nomenclature; Volume Relation of Gases in Chemical Change; Volume Formulæ; Molecular Weights; The Atomic Theory; Atomic Weights; Properties of Solutions; Descriptive Chemistry of the Commoner Elements and their compounds; The Periodic Law; Electrolysis; Spectrum Analysis; Chemical calculations.

Text-books: Smith's General Inorganic Chemistry. (The Century Co., New York.) Waddell's Arithmetic of Chemistry. (The Macmillan Co., New York.)

Beginners are advised to read Walker's Elementary Inorganic Chemistry. (J. Bell & Sons, London.)

2. *Laboratory Practice.* Monday at 3 p.m., Tuesday at 3 p.m., Friday at 3 p.m.

II.

Lectures on organic chemistry, Thursday at 11 a.m.

Laboratory practice two hours per week.

III.

Lectures on chemical laws and theories. Friday at 11 a.m.

IV.

Lectures on the chemistry of the metals, their occurrence in nature, reduction and uses. Thursday at 8 a.m.

Students may choose (II) or (IV) along with (III).
All engineering students take III and IV.
Students in Course D take II, III and IV.
Students in Course H take II and III.

Text-books:—Cohen's Theoretical Organic Chemistry. (Macmillan & Co.)
Richter's Inorganic Chemistry. (Chapters on Metals).
Walker's Physical Chemistry. (Macmillan & Co., London.)
Waddell's Arithmetic of Chemistry. Chap. VI to the end.
Alex. Smith's General Inorganic Chemistry, Chapters on Metals. (The Century Co., New York.)

V. (ORGANIC.)

The detailed study and preparation of selected carbon compounds—Wednesday, 2-5 p.m. Other hours by arrangement with class.

VI. (INDUSTRIAL.)

Lixiviation, Levigation, Evaporation, Distillation, Sublimation, Filtration, Crystallisation, Calcination, Refrigeration, Sulphur, Sulphuric Acid, Salt, Hydrochloric Acid and Sodium Sulphate, Soda, Chlorine, Nitric Acid, Ammonia, Cyanides, Pigments, Petroleum, Explosives, Cement.

1st term—Monday and Thursday at 3 p.m.

VII. (INDUSTRIAL.)

Fertilisers, Phosphorus, Arsenic, Sulphates, Potash, Glass, Ceramics, Bromine, Iodine, Water Glass, Peroxides, Oxygen, Carbon Bi-sulphide,

Carbon Tetra-Chloride, Manganates and Permanganates, Destructive Distillation of Wood, Illuminating Gas, Coal Tar, Vegetables and Animal Oils, Soap, Candles, Glycerine, Starch, Dextrine and Glucose, Cane Sugar, Fermentation Industries, Textile Industries, (Bleaching and Dyeing), Paper.

2nd Term—Monday and Thursday at 3 p.m.

Text-book:—Thorp's Industrial Chemistry. (The Macmillan Co., New York).

QUALITATIVE ANALYSIS.

VIII.

Students are required to do the first 25 *introductory exercises* in Noyes' Qualitative Analysis, and to hand in their note-books frequently for inspection. Students must complete their work before beginning the analysis of unknown substances. Exercises must be written in standard qualitative note books, to be had at the book stores.

IX.

Analysis of Solutions.

X.

Analysis of Metals and Alloys.

XI.

Analysis of Minerals.

XII.

Selected course for students in course E.

The practical work in qualitative analysis must be completed to the satisfaction of the instructors. Students are expected to master the theory as they proceed with the practice. A competent knowledge of theory will be required.

Text-books:—Arthur A. Noyes' Qualitative Analysis. (The Macmillan Co.)
Treadwell's Analytical Chemistry. Vol. I, Qualitative Analysis. (Translated by Hall; Wiley & Sons).
Fresenius' Qualitative Analysis.
Simon's Manual of Chemistry. (Lea Brothers & Co., Philadelphia.)

PHYSICAL.

XIII.

Courses B and D. For the session of 1908-09 the subjects will be Thermochemistry, Electrochemistry, the Properties of Solutions and the Kinetic Theory of Gases. Tuesday, 9 a.m.; Friday, 8-10 a.m.

Text-book:—Walker's Introduction to Physical Chemistry. (Macmillan & Co.)

XIV.

Courses B, D and G. Lectures on Monday at 9 a.m. and on Wednesday at 10 a.m.

QUANTITATIVE ANALYSIS.

The practical work must be completed to the satisfaction of the instructors. Students are expected to master the theory of the operations as they proceed with them, to write out sufficient explanations in standard note books, and to submit their note books for inspection when each analysis is completed.

XV.

1. Barium Chloride—Ba, Cl, H_2O
2. Calcium Carbonate—CaO, CO_2
3. A Phosphate—P_2O_5
4. Coal—moisture, volatile matter, fixed carbon, ash
5. Bleaching Powder—available chlorine
6. Iron Ore—Fe, SiO_2, S
7. Lead ore—Pb
8. Copper ore—Cu by electrolytic and cyanide methods
9. Nickel ore—Ni by electrolytic methods

XVI.

1. Dolomite—SiO_2, Al_2O_3 and Fe_2O_3, CaO, MgO, CO_2
2. Pig iron—Si, P, Mn, C

XVII.

1. Barite—BaO, SrO, SO_3
2. Bronze—Cu, Sn, Zn
3. Alkalimetry
4. Acidimetry
5. Chromite—Cr_2O_3
6. Feldspar—SiO_2, Al_2O_3, CaO, MgO, K_2O, Na_2O
7. Titaniferous iron ore—TiO_2, Fe, SiO_2, S, P, Mn, CaO, MgO
8. Arsenopyrite—As
9. An Ammonium Salt—NH_3
10. Zinc ore—Zn

XVIII.

1. Magnesium Sulphate—SO_3
2. Calcite—CaO, CO_2
3. Cement—CaO, MgO, Fe_2O_3, Al_2O_3, SiO_2, SO_3
4. Steel—Fe, Mn, C, Si, S, P
5. Water—Temporary and permanent hardness, Cl, oxygen, consuming power, total solids.

XV. is for course A, mining option.
XV. and XVI. is for course A, metallurgy option.
XV, XVI, and XVII is for courses B, C and D.
XVIII. is for course E only.

XIX.

Advanced Chemical Analysis and Assaying.

Practice in methods of chemical analysis and assaying, qualitative and quantitative analysis of rocks, minerals, and industrial products.

XX.

Chemical Works and Engineering.

A course of lectures on chemical manufactures from the engineering standpoint.

Excursions are made to chemical works when accessible.

FIRE ASSAYING.

XXI.

Fire assay of Gold and Silver
a. Gold in quartz.
b. Gold in an oxidised ore
c. Gold in sulphide ore
(1) by roasting, (2) by nail assay
d. Silver in pig lead or silver ore by cupellation.
e. Gold and Silver in copper matte
(1) by pot assay, (2) by scorification

Text-books: Bolton's Quantitative Analysis. (J. Wiley & Sons, New York).
Furman's Manual of Assaying. (J. Wiley & Sons.)
Waddell's Arithmetic of Chemistry. (The Macmillan Co.)
Fresenius' Quantitative Analysis.

THE CHEMICAL LABORATORIES.

The practical work in chemistry is carried on in five laboratories: No. 1 for qualitative analysis, Nos. 2 and 4 for quantitative analysis, No. 3 for experimentation in class, and No. 5 for preparation of chemical substances. Nos. 1 and 2 are fitted up with 62 and 42, locked work places, so that 104 students can be provided each with a set of apparatus under lock and key. These laboratories are

open from 8 a.m. to 5 p.m., and students are allowed to carry on their analytical work when not otherwise engaged. The number of hours a day to be spent in the laboratories depends to some extent on the aptitude of the student for experimentation. No 3 serves both as a laboratory and as a class room. It is furnished with seats and desks which are at the same time work tables. In No. 5 advanced students make organic and inorganic preparations. Besides these larger laboratories there are smaller rooms devoted to special branches of analytical chemistry and to research.

Each student, before entering any practical class, is required to deposit five dollars with the Secretary. On presenting to the instructor of the class the receipt for this, and the class ticket, the student receives the key of his place and a set of apparatus. The deposit is returned at the end of the session, breakages, etc., having been deducted.

Students are required to make their reports of analysis written neatly with ink on blanks provided for that purpose.

MINERALOGY.

ONTARIO HALL. *Third Floor.*

PROFESSOR—William Nicol, M.A.

FELLOW—Wyatt Malcolm, M.A.

The work in this department is intended for students taking the courses in (1) mining engineering and metallurgy, (2) chemistry and mineralogy, (3) mineralogy and geology, (4) chemical engineering, and (5) civil engineering.

It consists of six sections, viz.: Mineralogy I, II, III, IV, V and VI.

Students in Course A take sections I and III in the second year, section IV in the third year, and section VI in the fourth year.

Students in Courses B. and C. take sections I, II and III in the second year, and sections IV and VI in the third year.

Students in Course D take section I in the second year.

Students in Courses E and H take section V in the fall term of the second year.

MINERALOGY I.

Elementary Mineralogy.

The work in this class is intended as a preparation for those entering upon the studies of geology, petrography, mining and metallurgy. The class

should be taken in the second session, after junior chemistry and junior physics of the first session, as a knowledge of chemistry and physics is necessary for a proper comprehension of the subject. The regular work consists of (1) a course of lectures and demonstrations on crystallography at the beginning of the fall term, (2) illustrated lectures on the physical, optical and other properties of minerals, (3) the description of about sixty prominent Canadian minerals, (4) practical work in the determination of these by means of the blowpipe and field tests.

Each student is supplied for the session with a locked cabinet and collection of minerals for which he is held responsible, and for which a deposit must be made. The practical work of the class is conducted in the mineralogical and blowpipe laboratory, where cabinets containing specimens of commonly occurring minerals are arranged for use. Students are taught to recognize minerals by simple field tests, such as form, colour, streak, hardness, specific gravity, etc. For this work students must provide themselves with pocket-lens, knife, streak-plate and magnet.

The regular class meets at eleven a.m. on Mondays. Excursions to mineral localities in the vicinity of Kingston are held on the Saturdays of the fall term, and when the weather is unfavorable practical work is carried on in the laboratories and museum.

The class in blowpipe analysis meets in the blowpipe laboratory on Friday afternoons, 2-4 o'clock. Students must supply their own blowpipe apparatus.

Students are urged to make use of the museum in the basement and of the study room provided for them in the mineralogical department.

Text-Books:—Williams' Crystallography.
Miller's Minerals and How They Occur.
Brush & Penfield's Manual of Determinative Mineralogy and Blowpipe Analysis, 15th Ed., 1905. (Wiley & Sons).

Books for Reference:—Crosby's Tables for the Determination of Minerals.
Eakle's Tables.
Moses & Parsons' Mineralogy, Crystallography and Blowpipe Analysis, 2nd Ed.
Endlich's Manual of Qualitative Blowpipe Analysis.
Landauer's Blowpipe Analysis.
Kolbeck's 6th Ed. of Plattner's Probirkunst mit dem Löthrohre.

Books from the Department Library and from the Professor's private library may be obtained from the Professor.

MINERALOGY II.

Systematic Mineralogy.

The work of this class is intended for those taking courses B. and C., and is preparatory to the work in geology, petrography, and descriptive and

determinative mineralogy, which should be taken during the session following.

The regular work consists of a course of lectures, two hours per week, dealing with the physical, optical and other properties of minerals, illustrated by specimens from the lecture cabinet, microscopic slides, thin sections, models, charts and lantern slides. Essays on prescribed subjects are required.

The class meets at 11 a.m. on Tuesdays and Wednesdays in the mineralogy lecture room in the mineralogy-geology building.

Text-Books:—Dana's Text-book of Mineralogy, 1906. (Wiley & Sons).
Williams' Crystallography. (Henry Holt & Co.)

Books for Reference:—Miers' Mineralogy.
Tschermak's *Mineralogie.*
Brauns' *Mineralreich.*

MINERALOGY III.

Optical Mineralogy.

The work of this class is intended for those students only who are taking Course A., mining engineering, and is preparatory to the classes of petrography and determinative mineralogy, which should be taken during the session following. The work consists of the regular classes in systematic mineralogy for the winter term at 11 a.m. on Tuesdays and Wednesdays. The lectures treat of light and the optical properties of minerals. Reflection, diffusion, refraction, dispersion, polarization, absorption, color, etc., are described and illustrated by the use of the lantern and projection apparatus.
Text-Books:—Dana's Text-book of Mineralogy, 1906. (Wiley & Sons.)

MINERALOGY IV.

Descriptive and Determinative Mineralogy.

Before taking this class students in Course A. must have passed in Mineralogy I and III, and students in Courses B, and C. in Mineralogy I, II and III. It should be taken along with the classes of petrography, economic geology and metallurgy in the third year.

The work of this class consists in the exhibition and description of the mineral specimens contained in the several museum collections, special attention being given to ores, gangue-minerals, those having a commercial value and those of importance as rock-forming minerals in geology. By field tests and the use of the blowpipe, practice is obtained in the determination of minerals. Cabinets furnished with specimens of minerals from various parts of the world are supplied for students' use. The number of specimens is being constantly increased by collection, donation, exchange and purchase, the aim being to make the collection as complete as possible.

Text-Books:—Dana's Text-book of Mineralogy, 1907.
Brush & Penfield's Manual of Determinative Mineralogy and Blowpipe Analysis, 15th Ed., 1906.

MINERALOGY V.

Preparatory Mineralogy.

The work of this class is intended for students taking the course in civil engineering—Course E.—and for those who attend the class of Geology I. without any previous knowledge of mineralogy—students in Course H.

The work consists of a course of about a dozen practical demonstrations, one hour per week during the fall term, to make students familiar with the more common rock-forming minerals and ores, so that the geology lectures may be more intelligible. The students are taught to recognize minerals by field-tests, such as form, colour, lustre, streak, hardness, specific gravity, etc.

Minerals and text-books are supplied to the students for use each day.

The class meets on Wednesdays, at 10 a.m., in the mineralogy lecture room, Ontario Hall, third floor.

The attention of students is called to the collection of minerals on exhibition in the students' study, and to the several collections in the museum in the basement.

MINERALOGY VI.

Economic Mineralogy.

A course of lectures, illustrated by specimens and lantern slides, supplemented by demonstrations in the museum showing the occurrence and uses of minerals.

The following minerals and mineral substances will be treated: Petroleum, Asphalt, Graphite, Diamond, Antimony and Ores, Corundum, and Carborundum, Portland Cement, Feldspar and Kaolin, Talc, Asbestos, Phosphates, Gypsum, Nitre and Borax, the rare earths, the gem minerals, etc.

FIELD CLASSES IN GEOLOGY AND PROSPECTING.

The attention of students and others is called to the practical study of geology, mineralogy, and prospecting methods. Some of the chief mineral localities of the Kingston district are visited each session and abundant opportunities are offered for collecting specimens and studying the modes of occurrence of substances of economic value. These excursions are compulsory for all students in geology and mineralogy after the first year. The cost will not exceed $10.00

GEOLOGY.

PROFESSOR—

LECTURERS—M. B. Baker, B.A., B.Sc., and O. E. Le Roy, B.Sc.

The instruction in this department is adapted to the needs of the prospector, the mining engineer, and the professional geologist. Provision is also made for persons who desire a knowledge of the subject as part of a general

education. Graduates and others who wish to pursue some special line of investigation, or to have the use of the laboratories and apparatus, in order to work up material collected by themselves, will have every facility placed at their disposal.

Students have access to the Geological and Mineralogical museum, which contains a large number of specimens illustrative of petrography, palæontology, economic minerals, and general geology of Canada.

Advice concerning field work in Geology during the summer vacation will be given by the professor.

Students are advised to procure copies of some of the text-books and to gain some acquaintance with them during the long vacation preceding the beginning of the session in October.

The petrographical laboratories are supplied with electric power and provided with the most approved lathes and other apparatus needed in cutting, slicing, grinding and polishing specimens, and in the preparation of thin sections of minerals and rocks for microscopical examination.

Laboratory facilities are also provided for micro-chemical tests and for the use of the electric magnet and heavy soliutions in separating the constituents of the rocks.

The School owns a number of petrographical microscopes of the latest and most improved designs, and a large collection of thin sections of type rocks, minerals and ores with corresponding hand specimens, which are used by the classes for detailed study, under supervision of the staff.

The chemical laboratory of the Geological Department is supplied with the apparatus necessary for the chemical investigation of rocks and ores.

Laboratory facilities are also provided for geological experiments.

The reading room is supplied with geological publications and a library.

Second Year.

I.

ELEMENTARY GEOLOGY.

Students taking this class must have passed in junior chemistry. They are also required to take Mineralogy I or Mineralogy V.

The object of this course is to give a general knowledge of the subject as an introduction to the work of the third and fourth years.

The following themes will be treated of in the lectures:—

The planetary relations of the earth; the atmosphere; waters; solid crust; probable nature of the earth's interior; rocks, their general megascopic and microscopic characters and classification; volcanic action; earthquakes; upheaval; subsidence, geological effects produced by heat, air, water and life; bosses, dykes; veins; stratification; dip; strike; anticline and syncline; faults; foliation; nature and uses of fossils; stratigraphical geology; outline of the geological history of the globe, etc.

The lectures are illustrated by means of maps, diagrams and lantern views.

The laboratory work will consist of the examination of typical specimens of the different groups of fossil plants and animals, and of hand specimens of the more common rocks.

During the months of October and November excursions will be made to places of geological interest in the vicinity of Kingston. Students are expected to take part in all of these excursions. The cost will not exceed five dollars. Each student should provide himself with a suitable hammer, specimen bag and note-book.

Students are required to provide themselves with a copy of W. B. Scott's "An Introduction to Geology," 2nd edition (The Macmillan Co., price $2.60), which is used as text-book.

Books for Reference:

The Elements of Geology. (William H. Norton).
Kemp's "Handbook of Rocks," (price $1.50).
LeConte's Compend of Geology.
Dana's Manual of Geology, (last edition).
Chapman's Minerals and Geology of Ontario and Quebec.
Class Book of Geology (Geikie).

Third Year.

II.

GENERAL GEOLOGY AND GEOLOGY OF CANADA.

Before taking this class students must have passed in Geology I.

In this course special attention will be given to stratigraphical geology and the geology of Canada. Type fossils of the different formations will be studied.

Text-Book:—Geology, Vol. I (Chamberlain & Salisbury).

Books for Reference:—

Chapman's Minerals and Geology of Ontario and Quebec.
Dawson's Geology of Canada.
Dana's Manual of Geology.
Wood's Elementary Palæontology.
Reports of the Geological Survey of Canada.
LeConte's Elements of Geology.

III.

ELEMENTARY PETROGRAPHY.

Students must have passed in Geology I and optical or systematic mineralogy.

This course will consist of lectures on the use of the petrographical microscope and accessories in the determination of the rock-forming minerals, and on the determination of some of the more common igneous rocks.

The lectures will be illustrated by means of microscopic projections of thin sections of minerals and rocks, and will be supplemented by laboratory work of 2 hours per week all session.

A considerable variety of igneous rocks occurs in the Kingston district. These will be studied in the field and specimens will be collected by each student for examination in the laboratory.

Each student must provide himself with a copy of Kemp's Handbook of Rocks (price $1.50), and a copy of Luquer's Minerals in Rock Sections.

Text-Books and Books for Reference:

Rosenbusch—Iddings Microscopical Physiography of Rock-Forming Minerals.

Loewinson-Lessing's Tables for the Determination of Rock-Forming Minerals.

Hatch's Petrology.

Harker's Petrology for students.

IV.

MINING GEOLOGY.

Before taking this class students must have passed in Geology I.

Lectures on the origin, modes of occurrence and uses of metalliferous minerals, with mention of the chief localities. The characters by which ore bodies are sometimes indicated to the prospector will be described. A sketch will be given of the geology of some of the leading mining districts.

During the fall term excursions will be made to various mines in the vicinity of Kingston.

Each student is to provide himself with a copy of Branner & Newsom's Syllabus of Economic Geology (price $2.75).

Text-Books and Books for Reference:

Philips' Ore Deposits.

Kemp's Ore Deposits.

Nature of Ore Deposits by Dr. R. Beck, trans. by W. H. Weed.

Mineral Statistics, Geological Surveys of Canada and the United States.

Rothwell, the Mineral Industry. Vols. I-XIII.

Origin of Ore Deposits. American Institute of Mining Engineers.

V.

FIELD AND LABORATORY GEOLOGY.

The laboratory exercises in this course are designed to illustrate by means of specimens, models, photographs, maps and sections, the principal original and secondary structures of rock; the origin and mode of occur-

rence of rocks in the earth's crust, their cycles of alteration and change; their interpretation and representation in geological surveys.

The field work comprises observations upon the weathering of rocks; shore phenomena; glacial phenomena; igneous and sedementary rocks; faulting; folds; joints; cleavage; schistosity. Practice in methods of surveying and geological mapping and construction of sections; measuring the thickness of strata and determining the relative ages of geological structures.

Working hours will be arranged to suit the class at the beginning of the fall term.

Fourth Year.

VI.

GENERAL GEOLOGY.

A study will be made of structural and dynamical geology in connection with their bearings on economic problems.

Opportunities will be offered for those wishing to prosecute any special line of investigation.

Students are advised to devote as much time as possible to field work during the preceding long vacation, and to collect material for study in the laboratory during the winter.

Students are expected to supplement their reading by a study of the collections in the museum.

Text-Books and Books for Reference:

Chamberlain & Salisbury's Geology, Vol. I, II and III.
Geikie's Field Geology.
Geikie's Founders of Geology.
Zittel's History of Geology.
Geikie's Text-Book of Geology. 4th Ed.
Nicholson's Palæontology.
Zittel's Palæontology (Eastman).
Williams' Geological Biology.
Dana's Manual of Geology.

VII.

ADVANCED PETROGRAPHY.

A course of lectures will be given on the microscopic characters and classification of the igneous rocks and on the characters, origin and classification of the pre-Cambrian formation.

Special attention will be paid to the metamorphic series of the Kingston district, as exceptional opportunities are here offered for the study of the field relations of these rocks, and for attacking those problems as to their origin which are now attracting the attention of geologists.

Text-Books and Books for Reference:

Rosenbusch—*Die Massige Gesteine., Elemente der Gesteinslehre.*
Zirkel—*Lehrbuch der Petrographie.* Vols. I, II and III.
Levy and Lacroix—*Les Mineraux des Roches.*
Rosenbusch-Iddings—Microscopical Physiography of Rock-Forming Minerals.
Iddings—The Origin of Igneous Rocks.
Van Hise—Correlation Papers, Archæan and Algonkian.
Iddings, Weed, Pirson, Washington—Classification of Igneous Rocks.

VIII.

ECONOMIC GEOLOGY.

Students are required to take part in the excursions to various mines in the neighborhood of Kingston.

Lectures on the origin, modes of occurrence and uses of the metals and their ores; materias used in the production of light and heat; minerals used in chemical manufactures; fertilizers; mineral pigments, salt, brine and mineral waters; building materials; cements; refractory materials; abrasive materials; gems and precious stones; miscellaneous.

Text-Books and Books for Reference:

Applied Geology, S. G. Williams.
The Non-metallic Minerals, G. P. Merrill.
Economic Geology of the United States, H. Ries.
Mineral Statistics, Geological Surveys of Canada and United States.
Nature of Ore Deposits, Beck (Weed's Translation).
Reports of the Geological Surveys of Canada and the United States.
Ore Deposits of the United States and Canada, Kemp.

IX.

ROCKS AND ROCK WEATHERING.

This course is intended for students of Civil Engineering.

The occurrence, composition, texture, structure, and alterations of rocks will be considered with special reference to their effects on the workability of rocks and their uses as materials of construction.

Physiography and drainage will also be studied and a brief summary of the geology of Canada will be given.

Books for Reference:

Chapman's Geology of Canada.
Rocks, Rock Weathering and Soils. Merrill.
Stone for Building and Decoration. Merrill.

BOTANY.

Professor—Rev. James Fowler, M.A., LL.D.
Tutor—W. T. MacClement, M.A., D.Sc.

Pass Class.

Lectures or Laboratory Class at 10.00 a.m. on Tuesday, Wednesday and Thursday.

The work of this course is designed to furnish an intelligent conception of the structure, life processes, and life relations of plants, for students who may pursue the subject no further. At the same time it gives a foundation for advanced work for those who desire to make this a special study. The class work consists of lectures, discussions, and experimental study of plants and plant products. The principles of classification are illustrated by specimens of the chief orders of the plants of Canada.

Text-Books:—*Leavitt*—Outlines of Botany.
Gray—Field, Forest and Garden Botany.
(The above may be had bound together, Am. Bk. Co.
Coulter—Plant Relations.

ANIMAL BIOLOGY.

Professor—A. P. Knight, M.A., M.D.
Tutor—F. Etherington, M.D., L.R.C.P. & S., Edin.
Demonstrator—I. G. Bogart, M.D.

Pass Class.

Lectures or demonstration will be given tri-weekly at 9 a.m.

The lectures treat of protoplasm, cells, cell division, reproduction, early stages of development, tissues, organs, differences between animals and plants, general view of invertebrata and of vertebrata, organic evolution, every-day lives of animals.

The Laboratory work consists of such dissections and demonstrations as will elucidate the subject of the lectures. The lectures are illustrated by diagrams, charts, and lantern transparencies.

Text-Books:—Comparative Zoology, by J. S. Kingsley.
Animal Life, by Jordan and Kellog.

MINING ENGINEERING.

PROFESSOR—J. C. Gwillim, B.Sc.

These lectures follow the general plan as given under the headings Mining I, Mining II and Mining III.

Mining and milling machinery in actual operation together with lantern views assist these lectures. Current affairs in mining are introduced as much as possible to give the subjects a living interest.

It is expected that mining students will help their apprehension of the work, and their future prospects, by going into the mining districts during the summer vacations. The knowledge of Geology, Chemistry, Mineralogy, Mathematics and Physics, finds its usefulness and necessity in the consideration of the following subjects.

MINING I.

Ore Deposits. Conditions which produce and indicate them; their nature and origin; their affinity with certain conditions and rocks, and their classification. These lectures are supplementary to the study of economic geology.

Prospecting. Methods used in prospecting for lode, placer and coal mines. Location, laws and requirements of mineral prospects and their examination.

Development of Prospects, and the early workings of mines, with a consideration of the many factors entering into the proving up of mineral bodies as commercial quantities.

Boring. The use of long distance drills for prospecting, and for reaching fluids. The rotary Diamond drill, and the Percussion drills; their fields of operation and relative merits.

Excavation. The tools and machines used in breaking and removing rock. Also hand and power drilling to place explosives. The common mining explosives; their uses and operation.

Mining Methods. A consideration of the main factors in developing a mine. The sinking of shafts; driving of tunnels, etc. The stoping or winning of minerals from the vein or ore body.

MINING II.

Placer Mining. Consideration of alluvial deposits and their origin: The placer mining proper, hydraulic placer, and dredging placer mining.

Supports. Various forms of timbering or supporting a mine's passages, and stope excavations. The timbers used. Costs and alternative methods; causes of decay in timbers and their preservation. The use of iron and masonry.

Transportation. The handling of material underground, by chutes, cars, and hoists; rope and locomotive haulage. Surface transportation by road, rope, and railway. Loading, unloading, and terminal arrangements.

Hoisting. Head frames, ropes, and drums; various systems which balance the load to some extent or give a steady load on the engines. Hoisting of ore. Safety appliances and signalling.

Drainage. Sources of water, drainage by tunnels; hoisting of water; use of pumps, and principal types for light and heavy work. Bulkheads.

Ventilation. Natural and artificial conditions which demand ventilation. Methods of ventilating metal and coal mines. Gases of a coal mine. Fans, and distribution of air in coal mines.

Lighting. Use and place of candles, lamps, and safety lamps.

Accidents. Principles of Employment.

Mine examination and valuation.

MINING III.

One hour a week given to the reading and discussion of student's papers, upon actual mining operations, or experience in the field.

MINING IV.

This work includes the plotting of Mine Surveys, and the designing of some form of mining or milling plant.

Books for Reference:—(1) C. LeNeve Fosters' Ore and Stone Mining. (2) Coal and Metal Miners' Pocket-book. (3) H. W. Hughes' Coal Mining. (4) Current Mining Journals.

THE MINING AND METALLURGICAL LABORATORIES.

These are equipped for the testing of ores in small lots from different mining districts.

The machinery used is in most cases of standard sizes and the ores treated of sufficient quantities to give results which are about the same as commercial practice would give. The uses of the Mill and Laboratories are to furnish training and illustration, to experiment with various processes, and to give help at very reasonable rates to those who are seeking some method of treatment. The ores received are sufficient in quantity and variety to illustrate most of the usual methods of treatment found in actual practice. The work is divided into three main portions.

(1) Stamp Milling, Cyanidation, Chlorination and other Metallurgical processes in the term before Christmas.

(2) Concentration processes in the term after Christmas.

(3) In the Metallurgical Laboratory small quantities of ores are treated by smelting in blast or reverberatory furnaces, and experiments are conducted on the refining of metals, such as lead and copper; on the determination of the properties of iron and steel, and in connection with pyrometry, gas analysis, and the operation of the electric furnace.

The equipment of mill and laboratory as it stands at present consists of the following:—10 in. by 7 in. Blake jaw crusher; 16 in. crushing rolls; 5 stamp battery 850 lbs. stamps with automatic feeder; 10 in. cone grinder; No. 0 Krupp Ball Mill; impact screen; inlet discharge classifier; vertical line classifier; U-tube classifier for slimes; perforated board classifier for slimes; cone classifier and glass tube classifiers; 3 compartment spitzkasten; 3 compartment Hartz jig; 2 compartment Evans high-speed jig; 1 Vezin jig; 4 ft. Frue Vanner; Wilfley table (riffle washer); 16 ft. modern Evans buddle; vacuum oil separator; Wetherell magnetic concentrator; Ball-Norton magnetic separator; Sturtevant exhauster and blower; German dust tower; Heald and Sisco centrifugal pump; Frenier and Sons' spiral sand pump; Cazin water-motor; Northey mine pump; shaking screen; centrifugal machine for slime treatment; Johnston filter press for slime treatment; Ingersoll-Sergeant rock drill; Mac Machine Company's balanced valve rock drill; Rand rock drill; tripods for rock drill; drifting column for rock drill; Jackson's hand power rock drill; 25 H.P. Robb engine; barrel chlorination plant (350 pounds capacity); cyanide plant (1,000 pounds capacity); reverberatory roasting furnaces, small oil fired reverberatory, gas muffle furnace, soft metal melting furnace, electric furnace; No. 3 Reichhelm blower; 2 H.P., 4 H.P. and 6 H.P. electric motors.

A convenient assay laboratory has been fitted up in connection with the mill, where pyrometry, calorimetry gas analysis, and all the wet and fire assaying required for checking the mill work can be carried on.

METALLURGY.

PROFESSOR—F. S. Kirkpatrick, M.Sc.

METALLURGY I.

A thorough drilling in fuels, the special metallurgical uses of each kind, determination of calorific power, experimentally and by calculation from composition, calorific intensity and methods of pyrometry, charcoal manufacture, coals, coke, coking methods, physical and chemical tests of coke, by-product, coking, producer gas and its manufacture in modern approved appliances, liquid fuels, etc. This is followed by a brief discussion of the various types of metallurgical furnaces, then the physical properties of the common metals are considered, the effect of different impurities, and the constitution and character of the more important alloys. Special attention is given to the study of the properties of the irons and steels and the effect of the method of manufacture on these properties.

ORE DRESSING.

Ore Dressing. Picking and cobbing; crushing methods, and comparative effects in liberation of valuable minerals from gangue; sizing by screens and trommels; theory of fall of bodies in water; classification by the spitzkasten and spitzlutte; theory of jigging; types of jigs; sizing *versus* classification in the preparation of ores for jigging; friction service concentrators; riffle-washers; magnetic separators—types and application; special modification of concentrators, etc., for coal washing; oil concentration; schemes of practical working plants for all classes of ores.

Gold Milling. Free-milling plants; types of stamp mills, their efficiency and limitations. Construction and maintenance of stamp mills. Other methods of crushing for amalgamation. Principles and practice of amalgamation.

METALLURGY II.

Hydro-metallurgy of gold and silver, including cyaniding and chlorination of gold ores and leaching of silver ores with hyposulphite.

Milling and amalgamation of silver ores.

Metallurgy of copper, including treatment of native copper and sulphide ores by concentration and smelting, reverberatory and blast furnace matting, pyritic smelting, refining, and hydro-metallurgy.

Metallurgy of lead, including reverberatory and blast-furnace practice, softening, desilverising, refining, etc.

Metallurgy of iron and steel, including preparation of the ore for smelting, production of pig iron in the blast furnace, conversion into wrought iron in the puddling furnace, manufacture of steel by the crucible, Bessemer and open-hearth processes.

METALLURGY III.

Electro-metallurgy; introductory course in electro-chemistry followed by the consideration of the electric smelting of aluminum, copper, magnesium, iron, etc.

Also the consideration of the ordinary methods of recovering zinc, nickel, cobalt, tin, mercury, arsenic, antimony, etc., from the ores.

Text-Book and Books of Reference:

Metals, by Huntington & Macmillan (3rd year).
Introduction to the Study of Metallurgy. W. C. Roberts Austin.
Hand-book of Metallurgy, by C. Schnabel.
Gold. The Metallurgy of. T. K. Rose.
Stamp milling of Gold Ores. Rikard.
Practical Notes on the Cyanide Process. F. L. Bosqui.
Modern Copper Smelting. E. D. Peters.
Metallurgy of Lead. H. O. Hofman.
Manufacture and Properties of Structural Steel. H. H. Campbell.
Steel. A manual for steel users. William Metcalf (4th year).
Metallurgy of Steel. F. W. Harbord.
Practical Electro-Chemistry. B. Blount.
Electric Smelting and Refining. Borchers & McMillan.
Richard's Ore Dressing.

THERMODYNAMICS.

PROFESSORS—L. W. Gill, M.Sc., and F. O. Willhofft, M.E., A.M.

Before taking this class students must have passed in Mathematics I and II.

I.

Fundamental laws of Thermodynamics. Behaviour of gases under varying conditions. Theory of air compressors and air motors. Transmission of power by compressed air. Properties of steam and elementary theory of the steam engine. Thermal and mechanical efficiency of heat engines. Operation of simple valves and governors. Measurement of power. Elementary theory of gas engines.

Simple laboratory experiments.

II.

Continuation of I.

III.

Theory of refrigerating machines and systems. Entrophy and entrophy-temperature diagrams. Superheated steam. Performance of actual engines.

Influence of size, speed, and ratio of expansion on economy. Steam jackets. Compound and triple expansion engines. Expansion valves. Advanced theory of gas and oil engines. Steam turbines.

Experiments in Thermodynamic Laboratory.

THERMODYNAMIC LABORATORY.

The equipment of this laboratory includes an air compressor, gas engine, gasoline engine, centrifugal fans, centrifugal pumps, reciprocating pumps, steam engines, condensers, calorimeters, and dynamometers, together with all the auxiliary apparatus required for making tests and carrying on experimental work. All apparatus is of the standard type and latest design.

A considerable part of the practical work in Thermodynamics is carried on in connection with the central heating and power plant, which supplies heat and power to the various college buildings. This plant affords exceptional advantages for carrying on experimental work, having been designed with due regard to this feature.

A very important part of the work consists in carrying out commercial tests on various steam plants connected with the industries of Kingston.

GENERAL ENGINEERING.

Professor—Alexander Macphail, B.Sc.

This subject embraces the physical properties of materials used in the different branches of engineering and the principles involved in the theory of beams, columns, and structures.

GENERAL ENGINEERING I.

Materials of Construction.

Lectures comprise: Strength and quality of timber, stone, brick, cement, mortar, and concrete; physical properties of the metals and alloys used in engineering, and effects of impurities in them; testing for tensile, compressive and transverse strength.

Mechanics of Materials.

Resistance and elastictiy of materials; theory and design of simple and cantilever beams; pipes, cylinders, and riveted joints; analytical determination of stresses in simple framed structures; dead and live loads; centres of gravity; moments of inertia; shearing force and bending moments.

Graphical Statics.

Graphical representation of stresses is simple framed structures; graphical determination of centres of gravity; shearing forces and bending moments.

Lecture hours:—Monday, 11 a.m. Thursday, 9 a.m.

Books of Reference:—Merriman's "Mechanics of Materials."
Merriman's "Strength of Materials."
Thurston's "Materials of Construction."
Merriman's "Roofs and Bridges," Part II.

GENERAL ENGINEERING II.

Mechanics of Materials.

Analysis of restrained and continuous beams and columns: torsion of shafts; combined stresses; flexure of beams and theorem of three moments; plate and lattice girders and columns; resilience and fatigue of materials; initial and temperature stresses; earthworks, retaining walls and dams; arches and arched ribs; suspension bridges.

Graphical Statics.

Graphical determination of stresses in roof trusses, bridges, cranes, earthworks, retaining walls, dams, arches, arched ribs, cantilever and suspension bridges.

Theory of Structures.

Girders, roofs and bridges; selection of types with reference to span, loading, head-room, cost, aesthetic design and other considerations; relative advantages of riveted and pin connections; wind bracing and stiffening trusses; trestles and towers.

Lecture hours:—Monday, 2 p.m.; Wednesday, 10 a.m.

Books of Reference:—Bovey's "Theory of Structures."
Merriman's "Mechanics of Materials."
Merriman's "Roofs and Bridges," Part I, II, III.

GENERAL ENGINEERING III.

This course consists of practical work in the drafting rooms and testing laboratories.

Routine tests of cement, lime, mortar, brick, stone, timber, iron, steel, etc. Specific gravity, fineness, tensile and compressive, strength of cement, etc. Stress diagrams, and problems in connection with Gen. Eng. I and II.

GENERAL ENGINEERING IV.

This course is for Civil Engineering students of the 4th year, and consists of independent work in the testing laboratories.

GENERAL ENGINEERING V.

Lectures in this course comprise the care, handling, storing, qualities and use of the various explosives used in Engineering works.

ENGINEERING FIELD WORK.

PROFESSORS—A. K. Kirkpatrick, C.E., Alexander Macphail, B.Sc., L. Malcolm, M.A., B.Sc.

The classes in this subject are practical, and enable students to become perfectly familiar with the instruments and take charge of the different departments of Surveying work.

ENGINEERING FIELD WORK I.

Students who have completed Surveying I and II will be present at the School of Mining at 10 a.m., Friday, September 4th, 1908, to commence Field Work, and must procure the prescribed Field Book and draughting material. The class will be under canvas until September 29th, receiving full instruction in practical work in Stadia, Hydrographical, Land, Railway and other branches of Surveying II. The class is under camp organization. The tents, army sheets, camp utensils, &c., are furnished by the School. Each student must provide himself with a pair of heavy blankets or other bedding, draughting instruments, note books, detail, profile, cross section, and tracing paper. The expense of provisions, cooks, and personal transport must be borne by the students, an advance of $20.00 being made to cover same.

Throughout the work, the class will be in the field daily, and in the evenings must complete notes and draught the day's work. All notes and draughting must be completed by September 29th, 1908, for qualification. Students must notify the Secretary of their intention to attend this class not later than August 15th, 1908, so that all arrangements may be completed before the end of August, 1908. Students should also provide themselves with any Engineers' Field Books, Tables of Logarithms, &c., they may be able to procure.

ENGINEERING FIELD WORK II.

This work is for Civil Engineering students only and will consist of practical work in Railway Location, Switch Problems, and work connected with Bridge and other Surveys. When weather does not permit of outdoor work, the class will be employed draughting the results of the practical work or working of problems.

Qualification based on term work.

Students must provide themselves with Searle's Field Engineering, $3.00.

ENGINEERING FIELD WORK III.

For Civil Engineering students only, consists of practical work in Railway, Structural and Hydraulic Engineering.

When weather does not permit of outdoor work, time alloted will be devoted to the draughting of practical work done, or solution of problems.

Qualification based on term work.

ELECTRICAL ENGINEERING.

PROFESSOR—L. W. Gill, M.Sc.

LECTURER—E. W. Henderson, B.Sc.

I.

Fundamental Principles.

Electro-magnetism and electro-magnetic induction. The magnetic circuit. Induction of electric currents. Power and heat from electric currents. Self and mutual induction. Elementary theory of alternating and direct current generators and motors. Arc and incandescent lighting. Common methods of transmission and distribution of currents.

II.

Elementary Electrical Engineering.

Measurement of magnetic quantities. Further points in the theory of the magnetic circuit. Hysteresis and hysteresis loss. More advanced theory of self and mutual induction. Laws governing the flow of alternating currents in circuits containing resistance, inductance and capacity. Transformers, their theory, construction and operation.

Elementary laboratory work.

III.

Advanced exercises in drawing, with special attention to electrical apparatus.

IV.

Direct Currents.

Advanced theory of direct current machines. Energy losses, commutation and armature reaction. Series, shunt, and compound machines. Efficiency, operation and control of direct current generators and motors. Theory and practical applications of storage batteries. Boosters. Applications of direct current in commercial work.

Laboratory experiments with standard types of direct current apparatus.

V.

Alternating Currents.

Theory of alternating current generators. Synchronous and induction motors. Rotary converters. Measurement of power in polyphase systems. Phase changing. Multiphase systems. Transmission of power by alternating currents. Applications of alternating current apparatus.

Laboratory experiments with standard types of alternating current apparatus.

VI.

Drawing and Design.

Design of direct and alternating current apparatus.

The student will be required to design and make complete drawings of one or more pieces of apparatus.

ELECTRICAL LABORATORIES.

The various laboratories are the Dynamo Laboratories, for testing generators, motors and transformers; and the Standardizing Laboratory, equipped for calibrating meters and instruments of precision.

The Dynamo Laboratories are equipped with standard types of direct and alternating current generators and motors, together with all the necessary accessory apparatus, such as meters, rheostats, etc. The experimental machines are driven by direct connection to motors which receive their power either from the main power plant or from a storage battery, which gives a very steady supply of current often necessary in experimental work.

An important part of the work is the carrying out of commercial tests on various local plants, while in normal operation.

RAILWAY ENGINEERING.

PROFESSOR—A. K. Kirkpatrick.

RAILWAY ENGINEERING I.

Construction.

Lectures comprise: The effects of grades and curves on traffic. Calculations of quantities, overhaul, &c. Duties of resident engineer and his staff on construction. Calculation of progress and final estimates. Records and methods of keeping same. Railway act of Canada in relation to construction.

Lecture hour—Thursday, 9 a.m.

RAILWAY ENGINEERING II.

Construction.

Lectures comprise: Design of box and arch culverts. Estimation of waterway required. The protection of embankments. Different methods of obtaining and preparing foundations for structures. Pile and frame trestles. Methods of procedure in rock and earth excavations. Tunneling. Ballasting and tracklaying.

Lecture hour—Monday, 10 a.m.

RAILWAY ENGINEERING III.

Maintenance.

The upkeep of track, bridges, and buildings; their inspection and methods of repairs and renewals. The duties and responsibilities of the persons in charge.

Book of Reference:—Railway Track and Track Work by Trackman.

Lecture hour—Thursday, 10 a.m.

Structures.

General design of railway buildings, *i.e.*, stations, freight sheds, round houses, turn tables; coal handling appliances, sand and water stations, elevators, heating and ventilating of buildings.

Lecture hour—Wednesday, 11 a.m.

MUNICIPAL ENGINEERING.

PROFESSOR—A. K. Kirkpatrick.

LECTURER—L. Malcolm, M.A., B.Sc.

Water Supply.

Lectures comprise: Municipal water supply. Rainfall. Source of supply. Quantity, quality and purification of water. Distribution, designing, and details of construction. Domestic systems.

Lecture hour—Monday, 9 a.m. 2nd Term.

Sewage and Sewerage.

Lectures comprise: The various systems of collection, removal, and disposal of sewage, including septic tanks, contact filter beds, and disposal of sludge. Proportioning the size. Grade and flow in sewers. Methods of ventilation, flushing, and inspection. Methods of construction and material used.

Lecture hour—Wednesday, 10 a.m.

Streets.

Lectures comprise: Layout, grades, and roadbeds. Various kinds of pavements, and methods of construction, cost, and durability. Gutters, curbs, and gullies. Various kinds of walks; methods of construction; materials used; average life and cost.

Lecture hour—Tuesday, 11 a.m.

City and Highway Bridges and Electric Railways.

Aesthetic design of bridges of different types; details of construction. Determination of loads and analysis of stresses taken under General Engineering II. Electric Railways—Subgrade, rails, ties, curves, switches, pavements, power, grades, and bridges.

Lecture hour—Monday, 9 a.m. 1st Term.

HYDRAULIC ENGINEERING.

PROFESSORS—Alexander Macphail, B.Sc.; A. K. Kirkpatrick.

Comprises the study of Hydraulics, Canals, Harbors, River Improvements, Water Power, Irrigation, &c.

HYDRAULIC ENGINEERING I.

PROFESSOR—Alexander Macphail, B.Sc.

Hydraulics.

Application of hydrostatic pressure in the case of dams, gates and pipes. Flow of water and measurement of its volume by various orifices and weirs. Flow in open channels, streams, ditches, flumes, &c., and the use and application of these conductors of waters. Flow through tubes and pipes. Use of pipes as conductors of supply for domestic and power purposes. Dynamic and static pressure as applied to motors for power purposes. The efficiency of various water wheels, turbines, &c.

Lecture hours—Tuesday and Thursday, 10 a.m.

Text-Book:—Merriman's "Hydraulics."

HYDRAULIC ENGINEERING II.

PROFESSOR—A. K. Kirkpatrick.

Canals, Harbors and River Improvements.

Canals.—Economy in design of dimensions, based on traffic. Determination of cross section of canal. Materials required for banks, and method of construction. Dredging, blasting and improvements of existing water-ways. Design of locks, gates, controlling mechanism, &c. Hydraulic lifts.

Harbors.—Advantageous characteristics. Construction of piers, lighthouses, breakwaters, &c. Dredging, blasting, &c., for channels. Buoys, channel marks and range lights.

River Improvements.—Dredging of existing water-ways for navigation. Protection of channels, &c.

Lecture hour—Tuesday, 2 p.m.

Book of Reference:—Watt's Improvement of Rivers.

HYDRAULIC ENGINEERING III.

PROFESSOR—A. K. Kirkpatrick.

Water Power.

Natural watercourses. Dams for water power. Construction of earthen, loose rock and masonry dams and appendages. Storage reservoirs. Spillways and outlet sluices. Development of natural water powers. Transmission of power. Measurement of water power. Turbines and water wheels.

Design of hydraulic power plants.

Lecture hours—Tuesday, 10 a.m.

Book of References "Water Power," Jos. P. Frizell.

HYDRAULIC ENGINEERING IV.

PROFESSOR—A. K. Kirkpatrick.

Irrigation.

Hydrography. Precipitation, runoff, and stream flow. Evaporation, absorption and seepage. Alkali drainage and sedimentation. Subsurface water sources and sewage for irrigation. Irrigation canals. Classes of irrigation works, alignment, slope and cross-section headworks, and diversion weirs, regulators and escapes. Distributaries. Application of water and pipe irrigation. Estimates.

Lecture hour—Monday, 2 p.m.

Book of Reference: Irrigation Engineering, H. M. Wilson.

STRUCTURAL ENGINEERING.

PROFESSORS—A. K. Kirkpatrick, Alexander Macphail, B.Sc.

Students about to take Structural work should have completed Mathematics I and II, and General Engineering I.

STRUCTURAL ENGINEERING I.

Building Construction.

Selection of building materials, stone, wood, brick, &c. Foundations of buildings, walls, &c. Design of floors, floor beams, walls, roofing materials and other parts of buildings. Joints in wood, stone and iron.

Stone cutting and masonry. Concrete and reinforced concrete.

Students will be required to make independent designs of the various structures dealt with in the lectures.

Lecture hour—Tuesday, 2 p.m.

STRUCTURAL ENGINEERING II.

Bridge Engineering.

Lectures comprise: Examination of bridge site; economic number of spans and piers. Selection of truss or trusses.

Wooden and steel trestles, &c.

Design of foundations, abutments and piers.

Coffer dams and caissons.

Approaches. Ice breakers, &c.

Flooring. Hand railings. Guard rails. Stringers, floor beams, ties, &c.

Shop work and assembling.

Specifications, details, estimates and bills.

Two hours per week will be devoted to design of structures.

Lectures—Wednesday, 9 a.m.

STRUCTURAL ENGINEERING III.

Design of Structures.

Lectures will comprise the design of details in Bridge trusses and other structures, and the practical application of General Engineering I and II.

Projects will be given to the class in Roof and Bridge Design according to Standard Specifications usually consisting of a plate girder, rivetted truss, pin-connected truss, &c., which must be executed during the 4 hours allotted to this branch, complete stress sheets, working drawings, estimates, &c., being required.

Qualification will be based on term work.

Lecture Hour—Tuesday, 9 a.m.

Text-Books:—Merriman's Roofs and Bridges. Pts. I-IV.
"Cambria Steel" Hand-book.

MECHANICAL ENGINEERING.

PROFESSOR—F. O. Willhofft, M.E., A.M.

I.

Machine Design.

Simple and compound stresses. Allowable stress under various conditions. Straining actions in machines. Elementary principles of design. Application of principles to the design of bolts, cotters, rivetted joints, pipes and cylinders, bearings and journals, shafts and couplings. Belts, ropes and pulleys.

II.

Dynamics of Machines.

Dynamics of rotation. Efficiency of the screw, taking friction into account. Elementary dynamics of the steam engine. Fluctuation of crank effort. Speed and energy of fly wheels. Balancing of engines. Governors. Centrifugal machines.

III.

Mechanical Drawing.

Advanced exercises in drawing. Designs of simple machines.

IV.

Elementary Mechanical Engineering.

Steam production. Fuel and combustion. Boilers and boiler accessories. Boiler furnaces. Mechanical stokers and mechanical draft. Steam distribution. Pumps. Gas and gas production.

V.

Mechanical Engineering.

Condensers and cooling towers. Design of steam plants. Performance of steam driven machinery. Performance of gas and oil engines. Friction and lubrication. Transmission and distribution of power by steam, shafting, belts, compressed air, and electricity. Elements of locomotive engineering. Experimental work in Thermodynamics and Mechanical Engineering Laboratory.

VI.

Mechanical Drawing and Design.

Boiler and engine design. Water and air pumps. Gas engines and gas producers. Specifications.

The complete design of some complex machine and the preparation of the requisite drawings, tracings and blue-prints.

VII.

Mechanism.

A study of link work; wrapping connectors; velocity diagrams of various forms of mechanism; conditions and examples of rolling contact and sliding contact; design of cams; outlines of gear teeth; trains of gears and pulleys. Lectures, illustrated by working models, and work in drawing room.

Prerequisites, Mathematics I and II.

MECHANICAL ENGINEERING LABORATORY.

The Mechanical Engineering Laboratory is equipped with such apparatus as will give the student in Mechanical Engineering a thorough understanding of the practical details and the operation of boilers, steam and internal combustion engines, pumps and compressors, condensers, gears, valve gears, etc. An important feature of the work is the carrying out of tests on the central heating plant, involving the use of superheated steam. This plant is equipped with all modern appliances, such as Watertube and Return-Tubular Boilers, Mechanical Stokers, both on the Inclined Grate and Underfeed Systems, Mechanical Draft, induced and forced; Electric Hoist for handling coal and ashes; Feed Water Heater, etc.; all being especially arranged for testing. Thus it affords an excellent opportunity for the practical study of the production of steam on a commercial scale, and according to the most advanced ideas. Tests are also made in the various steam plants in the vicinity.

Provision is made for the investigation of all kinds of fuels, and products of combustion, a bomb calorimeter, a gas calorimeter and a flue gas apparatus being part of the equipment. The testing of lubricants is also included in the schedule of required experiments.

In all the laboratory work the tendency is not only to make the student familiar with the standard methods of testing, but to assign

special problems and to leave the solution to the students, thus teaching them to think for themselves, and leading them gradually to original research.

DESCRIPTIVE GEOMETRY.

Professor—Alexander Macphail, B.Sc.

This subject deals with the methods of representing objects on one or more planes so that the relative positions of the various parts can be clearly represented to the eye, and accurately determined by measurement. It deals with the various methods employed in the graphical solution of many problems arising in engineering design, and generally with the principles underlying all constructive drawing. The main object of the work is to develop the faculty of mentally picturing the relative positions of the different parts of a machine or structure, an essential process in all constructive work.

The work consists of one lecture per week, and two hours per week devoted to the working out of problems in the draughting room. The problems deal with the straight line and plane and solid figures, intersection of plane and curved surfaces, axometric projections and linear perspective.

Text-Book:—Elements of Descriptive Geometry. (Millar).

DRAWING.

DRAWING I.

Professors—A. K. Kirkpatrick, L. W. Gill, M.Sc.

The lectures and practical work are arranged with a view to preparing students for the subjects of Mechanical Drawing, Descriptive Geometry, &c., in the different branches of Engineering.

Each student at the opening of the term must provide himself with a set of drawing instruments, scales, set squares, T. square, thumb tacks, pens, pencils, inks and drawing paper of approved standard.

Drawing instruments and paper are supplied at the College Post Office at cost price.

Attendance of at least five hours a week is required, and students must arrange for these at commencement of term.

The class standing will be based on the term work.

The lectures will comprise: Practical Geometry of the line, circle, ellipse, parabola, hyperbola, spirals, cycloids, &c.; simple projection of planes and solids; lettering, &c.

Problems will be assigned to the class in the form of plates.

Book of Reference:—Rawles' Practical Geometry.

Lecture Hour—Thursday, 1 p.m.

DRAWING II.

Elementary principles of Mechanical Drawing. Sketching. Preparation of working drawings of valves, simple parts of machines, etc. Tracing and blue-printing.

The student is required to make dimensioned sketches of machine parts, and from these sketches make drawings.

DRAWING III AND IV.

Extension of work taken up in drawing II.

SURVEYING.

PROFESSOR—Alexander Macphail, B.Sc.
ASSISTANT—L. Malcolm, M.A., B.Sc.

All branches of Surveying receive full consideration. During the outdoor instruction students are given every opportunity to become familiar with the instruments. Notes of all field work are plotted in the draughting room.

SURVEYING I.

Lectures in Second Term.

These comprise: Classification of the different branches of Surveying. Description, use and adjustment of chains and tapes. Adjustment and use of transits, levels, clinometers, compass, &c.

Principles of Chain Surveying and Field Geometry.

Methods of taking field notes.

Lecture Hour—Monday, 10 a.m. (Second term only.)

Books of Reference: Raymond's Plane Surveying.
Gillespie's Surveying. Pt. I.
Hand-book for Surveyors—Merriman.

SURVEYING II.

Lectures First Term.

Principles of instrumental surveys. Compass and Transit Methods of Plotting, distributing errors, land survey computations and laying out of land into required areas. Levelling. Profiles. Cross sections. Farm, Topo-

graphical and Stadia surveys. Earthwork computations. Grading. Laying out curves, simple, compound and reverse. Azimuth and Latitude.

During the Fall term as many of the prescribed hours as possible will be devoted to field work.

Lectures Second Term.

Civil Surveying—comprising Simple Triangulation, Plane Table and its use on Topographical work. Hydrographical surveying. Surveying for Engineering works. Simple, Angular and Barometric Levelling. Railway Surveying.

Lecture Hours—Tuesday and Wednesday, 9 a.m.

Text-Books: Johnson's Plane Surveying.
Merriman's Hand-book for Surveyors.

Books of Reference: Field Books by Searles, Shunk and Godwin.
Raymond's Plane Surveying.

SURVEYING III.

This course is for Civil Engineering students of the second year, and consists of 2 hours per week practical work in the field and draughting room. Students will be required to undertake independent surveys connected with municipal and railway work.

SURVEYING IV.

Lectures.

Dominion Land Surveying.—Comprising the methods adopted in Survey of Dominion Lands, as laid down in Manual of Survey, issued 1903, by the Dominion Government.

Geodesy.—Comprising the principles and methods of procedure in extended triangulation. Determination of Latitude and Azimuth. Angular Levelling.

Mine Surveying.—Principles involved in Mine Surveys, and problems connected with underground work.

Lecture Hours—Fridays, 11 a.m.

Books of Reference: Manual of Survey for D.L.S.
Gore's Elements of Geodesy.

SURVEYING V.

For Civil Engineering Students Only.

Railway Surveys.—Problems in Location, Grades, Switches, Turnouts.

Engineering Work.—Bridge Surveys, Surveys for dams, building sites, reservoirs, &c., with practical problems connected with same.

Text-Book: Searle's Field Engineering.

Books of Reference: Engineer's Field Books by Godwin, Shunk, Hank, Trautwine, &c.

ECONOMICS.

A course of lectures on Economics with special reference to the needs of students in Practical Science will be given by Professor Shortt and Mr. Skelton during the first term of the session. The course will consist of twenty-one lectures extending over seven weeks and will comprise a general outline of economic principles with special reference to transportation, exchange, the nature and organization of joint stock companies and the various forms of corporate securities.

SHOP WORK.

Students in all courses except F. and G. will be given a course of practical work in the workshops of the School as per schedule of courses.

A student entering in 1908, or later, in either course F. or G., shall enter any commercial works approved by the School and take a special course of shop training extending over a period of thirty-six weeks (18 weeks between second and third, and 18 weeks between third and fourth college years); or, in case accommodation can not be secured, he shall attend a special course in the workshops of the School, extending over a period of 12 weeks (6 weeks preceding his third college year and 6 weeks preceding his fourth college year).

To ensure that as many students as possible will have an opportunity to obtain their shop training in commercial works, arrangements have been made with the management of several of the large manufacturing establishments, so that the students who have completed their second year, may enter upon a suitable course of shop training and receive such remuneration as will more than cover their expenses. In this case the student must present a certificate from the manager of the works in which he has carried out his practical work, stating the character of the work done and the amount of time spent in the various departments.

GIFTS OF REPORTS, PERIODICALS, ETC.

1906.

Canadian.

Presented by Dr. G. C. Hoffmann, Ottawa.

Eighteen Volumes of Chemical and Mineralogical Books and Magazines.
25 Years' Reports of Department of Mines, Nova Scotia, 1890-1905.

Presented by Mr. A. D. McRae, B.A., B.Sc.

One hundred Volumes Sessional Papers, &c.

Geological Survey of Canada, Ottawa.

The Cruise of the Neptune (2 copies).
Summary of Progress, 1906.

Census and Statistics Department.

Bulletin 1.

Canada Year Book, 1905

Department of the Interior.

Atlas of Canada, No. 1857.

Auditor General.

Report, June, 1906.

Department of Marine and Fisheries.

Report of Meteorological Service for year ending December, 1904.

Ontario Bureau of Mines.

Report, Vol. XV, Pt. I (1906).

British Columbia Department of Mines.

Annual Report of Minister of Mines, 1906.

Department of Mines, Quebec. (2 copies).

Mining Operations in 1906.

Nova Scotia Institute of Science.

Proceedings and Transactions, Vol. XI, Pt. 2.

Canadian Mining Institute Journal, Vol. IX, 1906.

Canadian Institute.

Transactions, Vol. VIII, Pt. 2.

British and Colonial.

Great Britain.

Geological Survey of the United Kingdom.
Summary of Progress in 1905.
Summary of Progress in 1906.
Geological Survey of Scotland.
Memoir on Oil Shales of the Lothians.

New South Wales.

Annual Report of the Department of Mines, 1906.
Official Year Book, 1904-05.
Report of Commission on Technical Education, 1905.
Twenty-seventh Report, Department of Lands, 1906.

Western Australia.

Year Book, 1902-04.
Report of Department of Mines, 1906.
Statistical Register, 1904.

Queensland.

Annual Report, Under-Secretary for Mines, 1906.
Department of Mines Publication, Nos. 201, 203, 205, 207, 208, 209, 210, 211, 212.

South Australia.

Review of Mining Operations for year ending June 30, 1906, and for year ending June 30, 1907.
Official Contribution to the Palæontology of South Australia.
Supplement to Paper No. 55, of 1906.
Contributions, 1907.

Victoria.

Annual Report of Secretary for Mines and Water Supply, 1906.

New Zealand.

Papers and Reports relating to Minerals and Mining, 1906, 1907.
Fortieth Annual Report, Colonial Laboratory.
Report of Analysis of New Zealand Coals.
Official Year Book, 1906.
Geological Survey, Bulletins Nos. 2, 3.

Tasmania.

Report of Secretary for Mines, 1905, 1906.

India.

Annual Report of Chief Inspector of Mines, 1906.
Records of Geological Survey, Vol. XXXIV, Pts. 3, 4.
Vol. XXXV, Pts. 1, 2, 3, 4.

Transvaal.

Report of Geological Survey, 1905.
Report of Commissioner on Mines, 1907.

American and Foreign.

United States Geological Survey.

Twenty-seventh Annual Report.
Monograph 50.
Bulletins 279, 286, 287, 294-297, 299, 300, 302, 303, 305, 306, 307, 308, 310, 312, 314, 315.
Water Supply and Irrigation Papers, 161, 182-185, 187-194, 200.
Professional Papers 46, 52, 54, 57.

U. S. Department of Commerce and Labor.

Special Report of Census Office.
Manufactures, Pt. 1, 1905.
Smithsonian Institution.
Annual Reports, 1891-95, 1905.
U. S. National Museum Reports, 1899-1901, 1903-05.

U. S. Department of Agriculture.

Year Book, 1905.
Bureau of Animal Industry Reports, 1904, 1905.
Bureau of Soils Report with Maps, 1904.
Maps alone, 1901 and 1903.

Alabama Geological Survey.

Underground Water Resources.

Idaho.

Mining Industry of 1906.

Illinois.

25th Annual Coal Report, 1906 (2 copies).
State Geological Survey Bulletin, No. 2.
Report, Bureau of Labor, 1904 (2 copies).

New Jersey.

Annual Report of the State Geologist, 1906 (2 copies).

New York.

Education Department.
Annual Report, 1905, 1906.
Secondary Education, Bulletin 33.
Second Report of the Director of the Science Division, 1905.
Report of the 6th Annual Conference of Sanitary Officers.

Ohio.

Geological Survey of Ohio, Bulletin 4.

West Virginia Geological Survey.

County Report, 1906.

American Institute of Mining Engineers.

Transactions, Vol. XXXVII.

Lake Superior Mining Institution.
Proceedings, Vol. XII.

Also the current Volumes as issued of—

The School of Mines Quarterly.
Forestry Quarterly.

Journal of the Society of Western Engineers, Chicago.
Proceedings of the American Society of Civil Engineers.
Proceedings of the Engineers' Society of Western Pennsylvania.
The Electrical News, Toronto.
The Canadian Engineer, Toronto and Montreal.
Engineering, London.
Cement and Engineering News, Chicago.
Industrial Advocate, Halifax.
Canada Lumberman.
Mines and Minerals, Scranton, Pa.
Mining Science, Denver, Col.
B. C. Mining Record, Victoria, B. C.
Science and Art of Mining, Wigan, England.
New Zealand Mines' Record.
Canadian Manufacturer, Toronto.
The Mining World, Chicago.
Canadian Mining Journal, Ottawa.
The Canadian Patent Office Record.
Inland Revenue Bulletin.
Labour Gazette.
The Illustrated Journal of Patents, London.
Diplomatic and Foreign Reports, Foreign Office, London.
    Annual Series.
    Treaty Series.
    Miscellaneous Series.
Labour Gazette, London.
West Indian Bulletin.
Monthly Report Chamber of Mines, West Australia.
Consular Reports, Washington.
Special Consular Reports.
Bulletin Department of Labor.
North Carolina Bulletin of Agriculture.
Experimental Station Record, Washington.

GRADUATES.

In the list are included graduates in the Faculty of Practical Science (B.Sc. and M.E.) and those graduates in Arts (B.A., M.A. and D.Sc.) since 1887, who after graduation have devoted themselves to scientific pursuits.

Graduates will confer a favor by forwarding changes of address to the Secretary.

Name.	Date of Graduation.	Occupation and Address.
Akins, J. R., B.Sc.	1907.	Topog. Survey, Ottawa.
Alder, W. R., B.Sc.	1907.	Bessemere.
Anson-Cartwright, R. H. M.,B.Sc.	1904.	Belleville.
Bailie, A. A., B.Sc.	1906.	Billing's Bridge.
Baker, C. W., B.Sc.	1905.	Can. Westinghouse Co., Hamilton, Ont.
Baker, J. C., B.Sc.	1903.	Department Indian Affairs, Ottawa
Baker, H. S., B.Sc.	1902.	422 Niagara Falls, Ont.
Baker, M. B., B.A., B.Sc.	1902.	Lecturer, Geology and Mineralogy, School of Mining, Kingston.
Baker, Wm. C., M.A.	1895.	Lecturer in Physics, School of Mining, Kingston.
Bartlett, J., B.Sc.	1907.	Mining Claim Inspector, Latchford
Bateman, G. C., B.Sc.	1905.	Sup. Topio Mining Co., Topio, Durango, Mexico.
Bell, James M., M.A.	1899.	Director Geol. Survey of New Zealand, Wellington, N.Z.
Berney, K. C.,B.Sc.	1906.	Can. Westinghouse Co., Hamilton.
Bolton, L. L., M.A., B.Sc.	1906.	Mines Dept., L. Superior Corporation, Sault Ste. Marie.
Brock, Reg. W., M.A.	1895.	Geological Survey, Ottawa.
Brown, T., B.Sc.	1904.	Surveyor and Assayer, Buffalo Mines, Cobalt.
Burrows, A. G., M.A., B.Sc.	1902.	Mining Claim Inspector, Latchford.
Cairns, D. D., B.Sc.1905, M.E.	1906.	Geologist, Geol. Survey, Ottawa.
Calvin, J. D., B.A., B.Sc.	1907.	Kingston.
Campbell, A. S., B.Sc.	1907.	
Carr-Harris, A., B.Sc.	1906.	Bisbee, Ariz.
Cartwright, C. T., B.Sc.	1905.	Consol. Mining & Smelting Co., Trail, B.C.
Cavers, T. W., B.Sc.	1904.	Claudet & Wynne, Rossland, B.C.
Code, E. S. L., B.Sc.	1907.	309 South Ave., Wilkinsburg, Pa.
Code, L. B., B.Sc.	1906.	424 Kelly Ave., Wilkinsburg, Pa.
Collins, E. A., B.Sc.	1905.	Mining Engineer, Webb City, Mo.
Connell, F. M., B.Sc.	1906.	Haileybury.

Name.	Date of Graduation.	Occupation and Address.
Corkill, E. T., B.Sc., 1904, M.E.	1905.	Inspector of Mines, Toronto.
Craig, H. B. R., B.Sc.	1903.	City Engineer, Kingston.
Craig, J. D., B.A., B.Sc.	1900.	Dominion Observatory, Ottawa.
Cumming, A. L., B.Sc.	1905.	Topographical Survey, Ottawa.
Currie, P. W., B.Sc.	1901.	Dept. of Interior, Ottawa.
Curtin, C. J., B.Sc.	1907.	Nicola Valley Coal Co, Coutlee, B.C.
Dennis, E. M., B.Sc.	1904.	Surveyor, Topog. Survey, Ottawa.
Dickson, C. W., M.A.	1900.	Lecturer, School of Mining, Kingston.
Dobbs, G. G., B.Sc.	1906.	Bessemere, Alabama, U.S.
Donnelly, John, jr., M.E.	1898.	Hydraulic and Mining Engineer, Kingston.
Dwyer, E., B.Sc.	1902.	Care of Westinghouse Co., Hamilton.
Fairlie, M. F., B.Sc.	1902.	St. Louis Smelt. & Ref. Co., Desloge, Missouri.
Fairlie, T. U., B.Sc.	1905.	
Ferguson, M. U., B.Sc.	1905.	Hawkesbury, Ont.
Finlayson, M. D., B.Sc.	1903.	Transcontinental Railway.
Finnie, H. V., B.Sc.	1906.	911 Franklin St., Wilkinsburg, Pa.
Fortescue, Charles L., B.Sc.	1898.	Westinghouse Co., Pittsburg, Pa.
Fox, Charles B., M.A.	1895.	Superintendent Pittsburg Reduction Co., East St. Louis.
Gage, R. J., B.Sc.	1905.	911 N. Vermilion St., Danville, Ill.
Germain, H. A., B.Sc.	1907.	Stanley Elect. Co., Pittsfield, Mass.
Gleeson, J. V., B.Sc.	1904.	Parry Sound.
Gordanier, W. N., B.Sc.	1903.	Napanee, Ont.
Graham, S. N., B.Sc.	1900.	Underground Supt. Mina el Favor Hostotipaquills, Jalisco, Mexico.
Grant, J. R., B.Sc.	1905.	Am. Bridge Co., 42 Broadway, N.Y.
Grenon, J. F., B.Sc.	1906.	Chicoutimi, Que.
Grover, G. A., B.Sc.	1902.	Toronto.
Guess, George A., M.A.	1894.	Chem. Cons. Copper Co., Cananea, Sonora, Mexico.
Guess, H. A., M.A.	1895.	Manager, Silver Lake Mine, Silverton, Col.
Hazlett, J. W., B.A., B.Sc.	1903.	(Deceased.)
Henderson, E. W., B.Sc.	1905.	Lecturer in Elect. Engineering, School of Mining, Kingston.
Herriot, G. H., B.Sc.	1907.	C.P.R. Maintenance Dept., London, Ont.
Houston, D. W., B.Sc.	1907.	537 S. 26th Ave., Omaha, Neb.

Name.	Date of Graduation.	Occupation and Address.
Instant, Reginald, B.A.	1895	Manager Corundum Refineries, Palmer's Rapids, Ont.
Irwin, R. T., B.Sc.	1907	
Jackson, H. G., B.Sc.	1903	Transcontinental R'y Survey.
Jenkins, W. E., B.Sc.	1907	The Warren Bitulithic Co., Edmonton, Alta.
Johnston, W. A., M.A., B.Sc.	1905	Geol. Survey, Ottawa.
Keith, G. C., B.Sc.	1907	232 McGill St., Montreal, Que.
Kilburn, D. G., B.Sc.	1907	T. & N. O. R'y, North Bay, Ont.
King, J. L., B.Sc.	1907	Fairfax, Man.
Kirkpatrick, Guy H., B.Sc., E.M.	1898	Colonial Club, White Hall Court, London, S.W., Eng., M.E. and Explorer in British Somaliland.
Knight, C. W., B.Sc.	1903	Bureau of Mines, Toronto.
Lavoie, E., B.Sc.	1907	Divisional Eng., Quebec.
Lazier, F. S., B.Sc.	1907	Trent Canal, Trenton.
Lennox, J. S., B.Sc.	1906	Stanley Elect. Co., Pittsfield, Mass.
Longwell, A., B.A., B.Sc.	1903	Cobalt, Ont.
Lodge, W. L., B.Sc.	1903	State Agric. Coll., Lansing, Mich.
Mabee, Horace C., B.Sc.	1898	Berry Bros., Detroit, Mich.
Malcolm, L., M.A., B.Sc.	1907	Lecturer in Civil Engineering, School of Mining, Kingston.
Malloch, G. S., B.A., B.Sc.	1906	Geol. Survey, Ottawa.
Malone, E. E., B.Sc.	1904	
Matheson, H., B.Sc.	1907	Geol. Survey, Ottawa.
Merritt, Charles P., B.Sc.	1899	(Deceased).
Millar, T. R., B.Sc.	1906	Lynn, Mass.
Montgomery, O. M., B.Sc.	1905	Westinghouse Co., Pittsburg, Pa.
Murray, C. W.	1907	Mission City, B.C. ... ...
Murray, J. C., B.A., B.Sc.	1901	Ed. Can. Mining Journal, Toronto.
McArthur, F., B.Sc.	1907	Asst. Engineer, Guelph.
McCallum, H. E., B.A., B.Sc.	1903	(Deceased).
McClement, Wm. T., M.A.	1903	Prof. of Botany, Queen's University.
McCulloch, R. O., B.Sc.	1907	Cobalt.
McDiarmid, S. S. R., B.Sc.	1903	Dominion Observatory, Ottawa.
McEwen, D. F., B.Sc.	1907	Edmonton, Alta.
MacIlquham, W. L., B.Sc.	1905	Topog. Survey, Ottawa.
Mackenzie, G. C., B.Sc.	1903	Bureau of Mines, Toronto.
McKay, G. J., B.Sc.	1907	Asst. in Mining and Metallurgy, School of Mining, Kingston.
McKay, R. B., B.Sc.	1904	Rosebud, Nev.
McKenzie, H. A., B.Sc.	1907	Denver Gas & Elect. Co., Denver, Colo.

Name.	Date of Graduation.	Occupation and Address.
Mackie, F. H., B.Sc.	1905.	Topog. Survey, Ottawa.
McLaren, G. R., B.Sc.	1907.	Wilbur.
McLennan, J. D., B.A., B.Sc.	1902.	Dominion Observatory, Ottawa.
McLennan, K. R., B.Sc.	1904.	Transcont. Ry. Survey.
McNab, A. J., B.A., B.Sc.	1902.	Chem., Trail Smelter, B.C.
MacNeill, W. K., B.Sc.	1903.	Melinda St., Toronto.
Macphail, J. G., B.Sc.	1905.	Office of Commissioner of Lights, Ottawa.
McRae, A.D., B.A., B.Sc.	1902.	Surveyor, Kingston & Pembroke Railway.
Neish, Arthur C., B.A.	1898.	Demonstrator, Columbia School of Mines, New York City.
Nicol, Wm., M.A.	1889.	Prof. of Mineralogy, School of Mining, Kingston.
Noble, D. S., B.Sc.	1902.	(Deceased).
Pense, E. H., B.Sc.	1904.	Pub. Works Dept., Toronto.
Peppard, H. M., B.Sc.	1907.	Montreal, Que.
Pinkerton, W. A., B.Sc.	1906.	Westinghouse E. & M. Co., Wilkinsburg, Pa.
Pope, Fred. J., M.A.	1890.	Asst. to John Hayes, Hemmingford, Que.
Potter, R., B.Sc.	1907.	City Engineer, Fernie, B.C.
Rawlins, J. W., B.A., B.Sc.	1901.	Chief Chemist, Canadian Copper Co., Copper Cliff, Ont.
Redmond, A. V., B.Sc.	1903.	Engineering Staff Grade Revission, C.P.R.
Reid, F. D., B.Sc.	1904.	Sup . C. Concentrator, Cobalt, Ont.
Reid, J. A., B.Sc.	1902.	Hamilton Iron & Steel Co., Hamilton, Ont.
Richardson, G.T.,B.Sc.	1906.	Kingston, Ont.
Robertson, J. J., B.Sc.	1906.	Santa Barbara, Chihuahua, Mexico
Rogers, Will C., B.A.	1899.	Chemist, Socorro Mine, Chihuahua, Mexico.
Rogers, W. R., B.Sc.	1907.	Cobalt, Ont.
Rose, S. L. E., B.Sc.	1903.	Gen. Elect. Co., Lynn, Mass.
Sands, J. M., B.Sc.	1907.	Asst. Engineer, Rossland, B.C.
Scott, H. H., B.Sc.	1905.	Elec. Engineer, Montreal, Que.
Scott, O. N., B.Sc.	1903.	Consulting Mining Eng., Toronto.
Scott, Thomas S., B.A., B.Sc.	1898.	121 S. Troga St., Ithaca, N.Y.
Sears, J., B.Sc.	1905.	Engineer, Construction T. & N. O. R.
Shorey, E. C., M.A., 1887, D.Sc.	1885.	Food Commissioner and Government Chemist, Hawaii Territory.
Shorey, P. M.,B.Sc.	1906	Cons. Min. & Smelting Co., Trail, B.C.

Name	Date of Graduation.	Occupation and Address.
Silver, L. P., B.Sc.	1902	420 St. Paul St., Montreal, Que.
Sloan, D., B.Sc.	1905	Carcross, Yukon.
Smeeton, W. F., B.Sc.	1901	Asst. Chem., Copper Co., Copper Cliff, Ont.
Smyth, W. L., B.Sc.	1906	"Earlscourt," Vancouver, B.C.
Squire, R. L., B.Sc.	1904	Assistant Engineer, Ottawa, Ont.
Stevens, F. G., B.Sc., M.E.	1901	Etzatlan, Jalisco, Mexico.
Stiles, L. P., B.Sc.	1907	Vancouver, B.C.
Stilwell, A. J., B.Sc.	1902	Hadley, Pr. of Wales Ld., Alaska.
Sutherland, T. F., B.Sc.	1904	Trail, B.C.
Strachan, B. O., M.E.	1905	Oliver Mining Co., Ely, Minn.
Sutherland, E., B.Sc.	1902	Brockville.
Thornton, L. A., B.Sc.	1906	Dept. of Public Works, Regina, Sask.
Thompson, A. Y., B.Sc.	1904	
Timm, W. B., B.Sc.	1906	Apartado 33, Guanajuato, Mexico.
Walker, H., B.Sc.	1904	Metcalfe, Ont.
Walker, Thomas L., M.A.	1890	Prof. of Mineralogy, Toronto University, Toronto.
Way, W. C., B.Sc., 1905, M.Sc.	1906	Can. Rand Drill Co., Montreal, Que.
Webster, A. R., B.Sc.	1904	Engineer, Power Works, Can. Copper Co., Turbine.
Wells, J. Walter, B.Sc.	1898	192 Shuter St., Toronto.
Wilgar, W. P., B.Sc.	1903	Div. Engineer, Transcontinental Survey, Ottawa.
Woolsey, W. J., B.Sc.	1907	Phoenix, B.C.
Workman, C. W., B.Sc.	1903	Mining Engineer, Etzatlan, Jalisco, Mexico.
Workman, J. K., B.Sc.	1904	Chemist, Helen Mine, Ont.
Wright, A., B.Sc.	1905	Brockville, Ont.
Wright, G. C., B.Sc.	1907	T. & N. O. Ry., North Bay, Ont.

LIST OF STUDENTS.

1907-'08.

FIRST YEAR.

Name.	Address.
Anderson, W. F. C.	Goderich, Ont.
Anglin, D. G.	Kingston.
Angrove, H. S.	Kingston.
Armstrong, L. N.	Kingston.
Armstrong, W. B.	Caledonia.
Armstrong, W. E.	Mille Roches.
Bartlett, R.	Kingston.
Bate, A. C.	Ottawa.
Bayne, G. M.	Kingston.
Berry, H. F.	Gananoque.
Bilsland, Wm.	Cornwall.
Bowen, N. L. (M.A.)	Kingston.
Bowen, Percy	Deseronto.
Bradley, H.	Georgetown.
Brewster, J. A.	Edmonton, Alta.
Brown, R. W.	Kingston.
Burroughs, C. W	Hazeldean.
Calvin, R.	Kingston.
Cameron, W. G. M	Niagara Falls S.
Carling, I. T.	Exeter.
Carmichael, H. M.	Kenora.
Carriere, D. E.	Grand Bend.
Caverhill, A. J.	Vanneck.
Chown, R. D.	Kingston.
Codner, W. S.	St. John, N.B.
Corbett, C. F.	Montreal.
Coutu, H. J.	Deseronto.
Crawford, V. W.	Kingston.
Davidson, E. M.	Portsmouth.
Davis, W. T.	Ottawa.
Dawson, S. G.	Ottawa.
Dewar, D. F.	Pembroke.
Dickson, G. M.	Waddington, N.Y.
Dinsmore, H. C.	Clarksburg.
Doyle, A. J.	Kingston.
Dunsford, G. C.	Ottawa.
Earle, H.	Central Park, B.C.
Earle, W. S.	Picton.
Elliott, E. F.	Kingston.
Fitzgerald, C. C.	Parry Sound.
Furlong, C. P.	Norwich.

Name.	Address.
Gates, A. B.	Kingston.
Gibson, A. H., (B.A.)	Lacombe, Alta.
Goodwin, G.	Ottawa.
Grady, J. M.	Kingston.
Grimshaw, M. D.	Kingston.
Haffner, A. B.	Kingston.
Harris, Herbert.	St. Catharines, Ont.
Hazlett, W. G.	Kingston.
Huber, W.	Bracebridge, Ont.
Hughson, W. G.	Niagara Falls.
Jarvis, H. R.	Napanee.
Johnston, J.H.	Essex.
Kirkeguard, C. A.	Deloro.
Kirkpatrick, A. K. M.	Kingston.
Lane, F. C.	Crookston, Ont.
Lawlor, A. P.	Kingston.
Lawson, L. D.	Winnipeg, Man.
Lennox, T. C.	Kingston.
Lloyd, G. H.	Gananoque.
Losee, W. H.	Collins' Bay.
Malloch, Norman.	Arnprior.
Marshall, J. R.	Ottawa.
Meikle, A. U.	Kingston.
Mills, W. W.	Renfrew.
Montgomery, W. G.	Gamebridge.
Moran, P. J.	Kingston.
Morgan, A. L.	Truro, N.S.
Moxley, J. H.	Ottawa.
Moyer, J. C.	St. Catharines.
Mullin, T. B.	Acton.
McDonough, J. P.	Kingston.
McEwen, L.	Warina.
Mackenzie, J. A.	Gravenhurst.
McKenzie, J. E.	Calgary, Alta.
McLaren, A. A.	Mitchell.
MacRostie, N. B.	Metcalfe.
Newman, W. A.	Kingston.
Palmer, R. N.	Norwich.
Phillips, H. L.	Cornwall.
Poitras, J. E.	Quebec, Que.
Potter, S. C.	North Gower.
Pringle, J. P.	Dawson City, Y.T.
Reid, T. J.	Kingston.
Robinson, J. N.	Kingston.

Name.	Address.
Rogers, R. A.	Gananoque.
Rooney, J. T.	Quebec, Que.
Schofield, S. J. (B.A.)	Kingston.
Scovil, S. S.	Kenora
Sirvage, E. G.	Chesterville.
Skinner, P. E.	Keene.
Slipper, S.	Port Arthur.
Sneath, T. D.	Woodstock.
Staebler, E.	Berlin.
Stevenson, L. D.	Newcastle, N.B.
Stewart, J. S.	Renfrew.
Stewart, W. G.	Waba.
Sutherland, D. H.	Bradford.
Swinburn, A. H.	Ottawa.
Thomas, A. S.	Kingston.
Thompson, E. A.	Brandon, Man.
Thomson, G. M.	Ayr.
Toro, E.	Manizales, Colombia, S.A.
Tremblay, J.	Baie St. Paul, Que.
Trimble, L. V.	Napanee.
Uglow, W. L. (M.A.)	Kingston.
Veilleux, W. H.	Sherbrooke, Que.
Walker, H. W.	Hamilton, Bermuda.
Watson, R. R.	Cornwall.
Wenger, H. A.	Ayton.
White, H. T.	Bottineau, N.D.
Wigle, E. R.	Kingsville.
Williams, K. F. A.	Kingston.
Wright, L. E.	Conway.

SECOND YEAR.

Name.	Address.	
Adams, W. B.	Wales	Mining.
Asselstine, B.	Belleville	Mining.
Bain, W. G.	Woodstock	Mechanical.
Bateman, A. M.	Kingston	Mining.
Battersby, W. F.	Brantford	Mining.
Bell, F. A.	St. Thomas	Civil.
Bell, W. A.	St. Thomas	Civil.
Bennett, J.	Kingston	Electrical.
Bertram, H. G.	Dundas	Mechanical.
Bourgoing, S.	Tadousac, Que.	Civil.
Butler, S. H.	Douglas, Man.	Electrical.
Callander, R.	Kingston	Civil.
Cameron, G.	Waterdown	Electrical.

Name.	Address.	
Carscallen, H. A.	Enterprise	Electrical.
Clarke, K. S.	Cobalt	Chemical.
Cook, W. E.	Kingston	Chemistry & Mineralogy.
Dobson, J. V.	Picton	Electrical.
Doncaster, P. E.	Orono	Chemical.
Dowsley, H. D.	Prescott	Mining.
Drewry, G. F.	Craigmont	Electrical.
Elliott, R. A.	Vancouver, B. C.	Mining.
Ellis, D.	Kingston	Electrical.
Ewart, M.	Medicine Hat, Alta.	Civil.
Fares, A. W.	Port Colborne	Civil.
Ferguson, G. M.	Ventnor	Mining.
Fletcher, W. J.	Valetta	Civil.
Gallaher, O. G.	Ottawa	Mining.
George, G.	Eganville	Electrical.
George, W. B.	Eganville	Mining.
Gillette, O.	Kingston	Mining.
Goedike, F. B.	Toronto Junction	Civil.
Hambly, W. R.	Napanee	Sanitary.
Holland, A. A.	Ottawa	Mining.
Hope, A.	Kingston	Mining.
Hubbard, W. H.	Toronto	Mechanical.
Huff, F. H.	Meaford	Mining.
Hutchison, R. H.		Mining.
Johnston, P. Keith	Cleveland, O.	Civil.
Keeley, D. E.	Railton	Mining.
Le Clair, F. G.	Lacona, N.Y.	Electrical.
Madden, M. S.	Napanee	Electrical.
Maguire, J.	Kingston	Electrical.
Morison, W. M.	Maxville	Mining.
McCaugherty, L. A.	Bath	Electrical.
McCullough, F. H.	Port Colborne	Mining.
McKay, A. A.	Rossland, B.C.	Mining.
McKenzie, R. M.	Eganville	Electrical.
McPherson, J. C. R.	Woodstock	Mining.
Neilson, L. R.	Stella	Civil.
Orser, E. H.	Kingston	Mining.
Purvis, S. A.	Bath	Civil.
Reyes, P.	New York, N. Y.	Mining.
Robinson, S. D.		Mining.
Rose, J. H.	Winchester	Mining.
Scott, A. W.	Brooklyn, N.Y.	Mining.
Sears, J. E.	Niagara Falls Centre	Electrical.
Simmons, G. A.	Simmons, Que.	Sanitary.
Spearman, C.	Stittsville	Mining.

Name.	Address.	
Stanley, J. L.	Port Colborne	Mechanical.
Stanley, O.	Port Colborne	Civil.
Teskey, E.	Croydon	Electrical.
Tower, W. O.	Bankhead, Alta.	Mining.
Tuckett, W. H.	Bath	Mining.
Wood, A. V.	Peterboro	Mining.
Young, J. H.	Almonte	Electrical.

THIRD YEAR.

Name.	Address.	
Agassiz, W. G. S.	Kingston	Mining.
Birkett, E. H.	Kingston	Mining.
Blenkhorn, S.	Canning, N.S.	Mining.
Bothwell, N. D.	Moosejaw, Sask.	Mining.
Brewster, F. A.	Vancouver	Mining.
Browne, P. J.	Kingston	Mining.
Bruce, E. L.	Smith's Falls.	Chemistry & Mineralogy.
Campbell, T. D.	Perth	Civil.
Campbell, W. E.	Dutton	Chemical.
Campbell, W. M.	Eganville	Mining.
Carmichael, J. E.	Strathcona, Alta.	Sanitary.
Chartrand, E.	Chartrand, Que.	Civil.
Cooper, R. N.r	Springhill, N.S.	Civil.
Daly, J. C.	Ottawa	Electrical.
Drury, C. W.	Kingston	Chemistry & Mineralogy.
Dwyer, W. O.	Kingston	Electrical.
Fleming, J. E.	Craigleith	Mining.
Frost, E. S.	Pembroke	Electrical.
Haddow, A. W.	Simcoe	Civil.
Hays, C. L.	Bowmanville	Civil.
Jackson, G. J.	Simcoe	Civil.
Jenkins, G. A.	Edmonton, Alta.	Civil.
Kelso, J. A.	Nelson, B.C.	Chemical.
Kilburn, G. H.	Vancouver, B.C.	Mining.
King, S.		Mineralogy & Geology.
Lawson, W. E.	London	Mining.
Lockett, W. F.	Kingston	Electrical.
Malloch, E. S.	Hamilton	Electrical.
Morison, A. G.	Woodstock	Mining.
McDowall, R. J.	Kingston	Mineralogy & Geology.
McEachran, J. J.	Gravenhurst	Mining.
McIntosh, J. S.	Iroquois	Civil.
Neilson, A. C.	Stella	Mechanical.
Newlands, N.	Kingston	Civil.
Nichols, D. A.	Ottawa	Mining.

Name.	Address.	
Nicol, D. S.		Electrical.
Ockley, R. F.	Kingston	Electrical.
Orr, W. J.	Kingston	Electrical.
Osborne, J. K.	Fernie, B. C.	Mining.
Peeling, C. U.	Campbellford	Electrical.
Perry, O. M.	Perth	Electrical.
Ransom, F.	Nelson, B.C.	Mining.
Roberts, W. H.	Kingston	Civil.
Rose, B.	Calgary, Alta.	Mineralogy & Geology.
Ryan, F. H.	Newburgh	Electrical.
Saint, J. B.	Eburne, B.C.	Civil.
Saunders, H. C.	Kingston	Civil.
Scott, J. N.	Wallaceburg	Mining.
Smith, R. R.	Bristol, N.H.	Mining.
Squire, A. M.	Kingston	Mechanical.
Stirling, J. B.	Picton	Civil.
Williams, M. Y.	Bloomfield	Mining.
Williams, T. B.	Bloomfield	Mining.
Woods, S. A.	Tamworth	Electrical.
Young, A. C.	Renfrew	Mining.

FOURTH YEAR.

Name.	Address.	
Arthur, A. J.	Sault Ste. Marie	Electrical.
Brown, E. W.	Hawkesbury	Mining.
Cordukes, J. P.	Kingston	Mining.
Cummings, A.	Fernie, B.C.	Civil.
Cunningham, S. L.	Kingston	Civil.
Dempster, H. O.	Gananoque	Civil.
Dunkley, J. B.	Picton	Civil.
Findlay, A.	Winnipeg, Man.	Civil.
Fleming, A. A.	Craigleith	
Fleming, D. B.	Craigleth	Electrical.
Fleming, H.	Craigleth	Mechanical.
Gardner, K. V.	Toronto	Mining.
Goodwin, W. M.	Kingston	Mining.
Grant, A. M.	Merigomish, N.S.	Electrical.
Harding, W. M.	Oshawa	Mining.
Hill, Jas.	Harrington West	Mineralogy & Geology.
Huber, W.	Bracebridge	Mining.
Jeffery, J. J.	Nelson, B.C.	Mechanical.
Jeffery, R. T.	Nelson, B.C.	Mechanical.
Marshall, J. H.	Stella	Mechanical.
Milden, A. J.	Cornwall	
Milliken, J. B.	Strathroy	Civil.

Name.	Address.	
McColl, C. R.	Chatham	Civil.
McGinnis, T. A.	Belleville	Civil.
McGinnis, W. C.	Belleville	Mining.
McKenzie, M.	Lake Megantic, Que.	Civil.
MacKay, B.R.	Cornwall	Mining.
Norrish, B. E.	Walkerton	Electrical.
Orford, C.	De Samar, Idaho	Mining.
Richmond, D. W.	Brighton	Electrical.
Rockwell, D. B.	Port Arthur	Mining.
Sine, F. L.	Kingston	Mineralogy & Geology.
Speirs, T. B.	Appleton	Electrical.
Stanley, J. N.	Port Colborne	Mining.
Stidwell, F.	Dutton	Civil.
Stott, J.	Sapperton, B.C.	Electrical.
Sweezey, R. O.	Quebec, Que.	Civil.
Trueman, J. D.	St. John, N.B.	Mining.
Twitchell, K. S.	St. Albans, Vt.	Mining.

SPECIAL STUDENTS.

Name.	Address.
Brown, C. D.	
Daigle, R. B.	Chipman, N.B.
Hooper, R. H.	Cardiff, England.
Reyes, E.	Bogota, Colombia, S.A.
Scott, J. Norris	Kingston.

CHEESE AND BUTTER

To the Value of $14,000,000

In round numbers, are manufactured in Ontario cheese factories and creameries. In order that larger profits shall accrue to those engaged in this great industry

THE EASTERN DAIRY SCHOOL

is maintained by the Ontario Government.

Every Cheese and Butter Maker

Who is not satisfied with his present knowledge of dairy science and practice,
is honestly striving to make dairying more remunerative, and
aspires to a position of greater usefulness and responsibility,

Should Attend

A course in Dairy Chemistry, both theoretical and practical, has been added to the curriculum of studies in the school. Illustrated calendar sent on application to

THE SUPERINTENDENT,
EASTERN DAIRY SCHOOL,
KINGSTON, ONT.